BÖLÜM
21

PARATİROİD CERRAHİSİ

Ömer BAYIR[1]
Mehmet Hakan KORKMAZ[2]

Giriş

Paratiroid bezinin varlığının, fonksiyonlarının ve hastalıklarının fark edilmesi ve tedavi protokollerinin oluşturulması yüzyıllarca süren zorlu bir süreç sonrasında gerçekleşebilmiştir. İlk kez 1850'de Sir Richard Owen tarafından bir gergedanın otopsisiyle tiroid bezine bağlı bir doku olarak tanımlanmış olsa da muhtemelen bazen gözle fark edilemeyecek kadar küçük ancak fonksiyonel olarak yaşamsal öneme sahip paratiroid bezinin varlığına inanmak bilim tarafından kabulü oldukça sancılı bir süreç sonrasında gerçekleşebilmiştir(1). Şöyle ki, henüz bir tıp öğrencisi iken hayvanlarda paratiroid bezinin varlığını fark etmiş olan Ivar Victor Sandström daha sonra insanlarda yaptığı anatomik çalışmalar sonucunda tiroid bezinin çevresindeki vaskülarize küçük bezleri fark etmiş ve bunları 'glandulae parathyroidea' olarak adlandırarak paratiroid bezinin isim babası olmuştur(2). Ancak Sandström'ün bu çalışması meslektaşları arasında yankı bulamamış ve konu ile ilgili makalesi birçok dergi tarafından reddedilmiştir. Uzunca uğraştan sonra Sandström makalesini kendi ana dilinde yayınlayabilmiştir. Belki de keşfinin kabul edilmemesi nedeniyle 37 yaşında intihar etmiştir. Bu yaşam öyküsü 'Ivar Sandström için zafer ve trajedi' olarak literatürde yerini almıştır(3).

Keşfedilen son endokrin bezleri olan paratiroid bezlerinin hastalıklarının tanı ve tedavisi ile ilgili çalışmalarıyla mihenk taşı olan birçok araştırmacı sıralanabilir. Ancak bu bölümün konusu ile ilgili öncelikle zikredilmesi gereken iki isim bulunmaktadır. İnsanda paratiroid cerrahisine 1925 yılına kadar hiçbir cerrah cesaret edemedi. İnsanda ilk paratiroid cerrahisi denemesi bir Kulak Burun Boğaz Uzmanı olan Oscar Hirsch tarafından 1925 yılında, Viyana'da, von Recklinghausen Hastalığı olan bir hastaya paratiroidektomi (PTx) yaklaşımlarından ilki olan bilateral boyun eksplorasyonu (BBE) şeklinde uygulandı ancak paratiroid bulunamadı. İlk başarılı paratiroid cerrahisi ise aynı yıl Oscar Hirsch'ten sonra, aynı şehirde, aynı hastalığı olan bir başka hastaya

[1] Doç. Dr., Sağlık Bilimleri Üniversitesi, Ankara Etlik Şehir Hastanesi, Kulak, Burun, Boğaz ve Baş Boyun Cerrahisi Kliniği, bayiromer@hotmail.com.
[2] Prof. Dr., Ankara Yıldırım Beyazıt Üniversitesi, Tıp Fakültesi, Kulak, Burun, Boğaz AD., mhkorkmaz@hotmail.com.

mi kazanmış bez veya bezlerin tamamen çıkarılması, SHPT'de ise hiperplazik ve hiperaktif bütün bezlerin çıkarılıp normal PTH salgılayacak kadar bir bez kısmının bırakılması/ototransplantasyonu tedavi edicidir. Preoperatif radyolojik ve sintigrafik yöntemlerle tespit edilen adenomların bulunması ve çıkarılması, cerrahın tecrübesine bağlı olarak, önemli bir zorluk göstermez. Preoperatif lokalizasyon tespit çalışmaları sonuçsuz ise ve cerrahi endikasyon kesin ise; ektopik ve inmemiş PTH bez lokalizasyonlarını da eksplore edecek ve gerekirse BBE yapacak şekilde cerrahi planlama yapılmalıdır. SHPT cerrahisinde ise postoperatif kalıcı hipokalsemiyi önleyecek şekilde cerrahi uygulanmalı; total PTx (4 bez) ve ototransplantasyon veya subtotal (3/4 bez) PTx dikkatli bir şekilde gerçekleştirilmelidir. Bu cerrahiler sırasında RLS hasarından kaçınılacak her türlü tedbir alınmalı, mümkün olan en az diseksiyon ve eksplorasyonla hedef dokular çıkarılmalıdır. Rekürren cerrahilerde olası komplikasyon oranlarının artacağı unutulmamalıdır. Komplikasyonsuz ve başarılı bir HPT cerrahisi için cerrahın tecrübesinin yanısıra endokrinolog, nükleer tıp ve radyoloji hekimlerinin tecrübesi ve multidisipliner anlayışla ve mümkünse konsey yaparak çalışılması çok önemlidir. Cerrahın uygulayacağı cerrahi yöntem ise yine tecrübe ve mevcut teknolojik imkanlara göre farklılıklar gösterebilir. Burada önemli olan, yöntemden çok başarılı bir HPT cerrahisini komplikasyonsuz gerçekleştirebilmektedir.

Teşekkür: Yazarlar, Prof. Dr. Güleser Saylam'a (SBÜ, Ankara Etlik Şehir Hastanesi, Kulak Burun Boğaz ve Baş Boyun Cerrahisi Kliniği, Ankara) görsellere yaptığı katkıdan dolayı teşekkür eder.

Kaynaklar

1. Dubose J, Ragsdale T, Morvant J. "Bodies so tiny": the history of parathyroid surgery. Curr Surg. 2005 Jan-Feb;62(1):91-5. doi: 10.1016/j.cursur.2004.07.012. PMID: 15708157.
2. Giddings, C., Rimmer, J., & Weir, N. (2009). History of parathyroid gland surgery: An historical case series. The Journal of Laryngology & Otology, 123(10), 1075-1081. doi:10.1017/S002.221.5109005702.
3. Breimer L, Sourander P. The discovery of the parathyroid glands in 1880: triumph and tragedy for Ivar Sandström. Bull Inst Hist Med 1981;5:558–63. PMID: 7039741
4. Kanat B.H., Ünal B. & Doğan S. (2021). Paratiroid bezi ve tarihçesi. IN Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.1-5). Ankara, Türkiye Klinikleri.
5. Siperstein A.E., Stephen A.E. & Milas M. (2021). Standard Bilateral Parathyroid Exploration. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 517-528). Philadelphia, Elsevier.
6. Cho N.L., Doherty G.M. (2021). Principles in Surgical Management of Primary Hyperparathyroidism. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 502-516). Philadelphia, Elsevier.
7. Madison D.L. (2017). Single-Gland Primary Hyperparathyroidism: Classic and Early Disease. In Stack, Jr. B.C., Bodenner D.L. (eds), Medical and Surgical Treatment of Parathyroid Diseases (pp.41-56). Little Rock, Springer.).
8. Lal G., Clark O.H. (2006). Hiperparatiroidizm cerrahisi genel bakış. In İşgör A. (ed), Paratiroit Hastalıkları ve Cerrahisi. (pp.347-369). İstanbul, Avrupa Tıp Kitapçılık.
9. NIH conference. Diagnosis and management of asymptomatic primary hyperparathyroidism: consensus development conference statement. Ann Intern Med. 1991;114(7):593-7. doi: 10.7326/0003-4819-114-7-593.
10. Bilezikian JP, Brandi ML, Eastell R, Silverberg SJ, Udelsman R, Marcocci C, Potts JT Jr. Guidelines for the management of asymptomatic primary hyperparathyroidism: summary statement from the Fourth International Workshop. J Clin Endocrinol Metab. 2014;99(10):3561-9. doi: 10.1210/jc.2014-1413.
11. Talpos GB, Bone HG 3rd, Kleerekoper M, Phillips ER, Alam M, Honasoge M, Divine GW, Rao DS. Randomized trial of parathyroidectomy in mild asymptomatic primary hyperparathyroidism: patient description and effects on the SF-36 health survey. Surgery. 2000;128(6):1013-20;discussion 1020-1. doi: 10.1067/msy.2000.110844.
12. Silverberg SJ, Gartenberg F, Jacobs TP, Shane E, Siris E, Staron RB, McMahon DJ, Bilezikian JP. Increased bone mineral density after parathyroidectomy in primary hyperparathyroidism. J Clin Endocrinol Metab. 1995;80(3):729-34. doi: 10.1210/jcem.80.3.7883824.
13. Pasieka JL, Parsons LL, Demeure MJ, Wilson S, Malycha P, Jones J, Krzywda B. Patient-based surgical outcome tool demonstrating alleviation of symptoms following parathyroidectomy in patients with primary hyperparathyroidism. World J Surg. 2002;26(8):942-9. doi: 10.1007/s00268.002.6623-y.
14. Majcen M, Hocevar M. Surgi-

cal options in treating patients with primary hyperparathyroidism. Radiol Oncol. 2020 Feb 29;54(1):22-32. doi: 10.2478/raon-2020-0010.
15. Lal G., Clark O.H. (2006). Bilateral Boyun Eksplorasyonu. In İşgör A. (ed), Paratiroit Hastalıkları ve Cerrahisi. (pp.369-383). İstanbul, Avrupa Tıp Kitapçılık.
16. Untch B.R., Shaha A.R. (2017). Bilateral Neck Exploration for Primary Hyperparathyroidism. In Stack, Jr. B.C., Bodenner D.L. (eds), Medical and Surgical Treatment of Parathyroid Diseases (pp.223-231). Little Rock, Springer.
17. Korkmaz MH, Bayır Ö, Tatar EÇ, Saylam G, Öcal B, Keseroğlu K, Özdek A. Glottic airway gain after 'suture arytenoid laterofixation' in bilateral vocal cord paralysis. Acta Otolaryngol. 2015 Sep;135(9):931-6. doi: 10.3109/00016.489.2015.1042554.
18. DukeW.S. (2017). Unilateral Neck Exploration for Primary Hyperparathyroidism. In Stack, Jr. B.C., Bodenner D.L. (eds), Medical and Surgical Treatment of Parathyroid Diseases (pp.213-221). Little Rock, Springer.
19. Cho NL, Gawande AA, Sheu EG, Moore FD Jr, Ruan DT. Critical role of identification of the second gland during unilateral parathyroid surgery: a prospective review of 119 patients with concordant localization. Arch Surg. 2011 May;146(5):512-6. doi: 10.1001/archsurg.2011.91.
20. Mortier PE, Mozzon MM, Fouquet OP, Soudan BC, Huglo DG, Cussac JF, Proye CA. Unilateral surgery for hyperparathyroidism: indications, limits, and late results--new philosophy or expensive selection without improvement of surgical results? World J Surg. 2004 Dec;28(12):1298-304. doi: 10.1007/s00268.004.7468-3.).
21. Scott-Coombes DM, Rees J, Jones G, Stechman MJ. Is Unilateral Neck Surgery Feasible in Patients with Sporadic Primary Hyperparathyroidism and Double Negative Localisation? World J Surg. 2017 Jun;41(6):1494-1499. doi: 10.1007/s00268.017.3891-0.
22. Barczyński M, Gołkowski F, Nawrot I. The current status of intraoperative iPTH assay in surgery for primary hyperparathyroidism. Gland Surg. 2015 Feb;4(1):36-43. doi: 10.3978/j.issn.2227-684X.2015.01.01.
23. Lew JI, Solorzano CC, Montano RE, Carneiro-Pla DM, Irvin GL 3rd. Role of intraoperative parathormone monitoring during parathyroidectomy in patients with discordant localization studies. Surgery. 2008 Aug;144(2):299-306. doi: 10.1016/j.surg.2008.03.039.
24. Westerdahl J, Bergenfelz A. Unilateral versus bilateral neck exploration for primary hyperparathyroidism: five-year follow-up of a randomized controlled trial. Ann Surg. 2007 Dec;246(6):976-80; discussion 980-1. doi: 10.1097/SLA.0b013e31815c3ffd.
25. Wilhelm SM, Wang TS, Ruan DT, Lee JA, Asa SL, Duh QY, Doherty GM, Herrera MF, Pasieka JL, Perrier ND, Silverberg SJ, Solórzano CC, Sturgeon C, Tublin ME, Udelsman R, Carty SE. The American Association of Endocrine Surgeons Guidelines for Definitive Management of Primary Hyperparathyroidism. JAMA Surg. 2016 Oct 1;151(10):959-968. doi: 10.1001/jamasurg.2016.2310.
26. James BC, Kaplan EL, Grogan RH, Angelos P. What's in a name?: Providing clarity in the definition of minimally invasive parathyroidectomy. World J Surg. 2015 Apr;39(4):975-80. doi: 10.1007/s00268.014.2902-7.
27. Parangi S, Pandian T.K., Thompson G. (2021). Minimally Invasive Single Gland Parathyroid Exploration. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 529-536). Philadelphia, Elsevier.
28. Pintaric TS, Hocevar M, Jereb S, Casati A, Novak Jankovic V. A prospective, randomized comparison between combined (deep and superficial) and superficial cervical plexus block with levobupivacaine for minimally invasive parathyroidectomy. Anesth Analg. 2007 Oct;105(4):1160-3, table of contents. doi: 10.1213/01.ane.000.028.0443.03867.12.
29. El-Hady HA, Radwan HS. Focused parathyroidectomy for single parathyroid adenoma: a clinical account of 20 patients. Electron Physician. 2018 Jun 25;10(6):6974-6980. doi: 10.19082/6974.
30. Lew JI, Solorzano CC. Surgical management of primary hyperparathyroidism: state of the art. Surg Clin North Am. 2009 Oct;89(5):1205-25. doi: 10.1016/j.suc.2009.06.014.
31. Brunaud L, Li Z, Van Den Heede K, Cuny T, Van Slycke S. Endoscopic and robotic parathyroidectomy in patients with primary hyperparathyroidism. Gland Surg. 2016 Jun;5(3):352-60. doi: 10.21037/gs.2016.01.06.
32. Hessman O, Westerdahl J, Al-Suliman N, Christiansen P, Hellman P, Bergenfelz A. Randomized clinical trial comparing open with video-assisted minimally invasive parathyroid surgery for primary hyperparathyroidism. Br J Surg 2010; 97: 177-84. doi: 10.1002/bjs.6810.
33. Wu YJ, Cheng BC, Chiu CH, Huang SC, Li LC, Chung SY, Den Chen K, Pan CC, Li JY, Lin HW, Chen YH, Liang PL, Co JS, Chi SY, Chou FF, Lin CC. Successful Modified Transoral Endoscopic Parathyroidectomy Vestibular Approach For Secondary Hyperparathyroidism With Ectopic Mediastinal Glands. Surg Laparosc Endosc Percutan Tech. 2019 Dec;29(6):e88-e93. doi: 10.1097/SLE.000.000.0000000727.
34. Sun Y, Cai H, Bai J, Zhao H, Miao Y. Endoscopic total parathyroidectomy and partial parathyroid tissue autotransplantation for patients with secondary hyperparathyroidism: a new surgical approach. World J Surg. 2009 Aug;33(8):1674-9. doi: 10.1007/s00268.009.0086-3.
35. Gagner M. Endoscopic subtotal parathyroidectomy in patients with primary hyperparathyroidism. Br J Surg. 1996 Jun;83(6):875. doi: 10.1002/bjs.180.083.0656.
36. Ohgami M, Ishii S, Arisawa Y, Ohmori T, Noga K, Furukawa T, Kitajima M. Scarless endoscopic thyroidectomy: breast approach for better cosmesis. Surg Laparosc Endosc Percutan Tech. 2000 Feb;10(1):1-4.

37. Ikeda Y, Takami H, Sasaki Y, Kan S, Niimi M. Endoscopic neck surgery by the axillary approach. J Am Coll Surg. 2000 Sep;191(3):336-40. doi: 10.1016/s1072-7515(00)00342-2.
38. He Q, Zhu J, Zhuang D, Fan Z. Robotic total parathyroidectomy by the axillo-bilateral-breast approach for secondary hyperparathyroidism: a feasibility study. J Laparoendosc Adv Surg Tech A. 2015 Apr;25(4):311-3. doi: 10.1089/lap.2014.0234.
39. Entezami P, Boven l, Ware E, Chang BA. Transoral endoscopic parathyroidectomy vestibular approach: A systematic review. Am J otolaryngol. 2021;42(1):102810).
40. Fouquet T, Germain A, Zarnegar R, Klein M, De Talance N, Claude Mayer J, Ayav A, Bresler L, Brunaud L. Totally endoscopic lateral parathyroidectomy: prospective evaluation of 200 patients. ESES 2010 Vienna presentation. Langenbecks Arch Surg. 2010 Sep;395(7):935-40. doi: 10.1007/s00423.010.0687-1.
41. Özdemir M., Makay Ö. (2021). Paratiroid Hastalıklarında Endoskopik ve Diğer Yenilikçi Yaklaşımlar. IN Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.90-93). Ankara, Türkiye Klinikleri.
42. Henry JF, Sebag F, Tamagnini P, Forman C, Silaghi H. Endoscopic parathyroid surgery: results of 365 consecutive procedures. World J Surg. 2004 Dec;28(12):1219-23. doi: 10.1007/s00268.004.7601-3.
43. Bellantone R, Raffaelli M., Lombardi C., De Crea C. (2021). Minimally Invasive Video-Assisted Parathyroidectomy. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 537-545). Philadelphia, Elsevier.
44. Miccoli P, Bendinelli C, Berti P, Vignali E, Pinchera A, Marcocci C. Video-assisted versus conventional parathyroidectomy in primary hyperparathyroidism: a prospective randomized study. Surgery. 1999 Dec;126(6):1117-21; discussion 1121-2. doi: 10.1067/msy.2099.102269.
45. De Crea C, Raffaelli M, Traini E, Giustozzi E, Oragano L, Bellantone R, Lombardi CP. Is there a role for video-assisted parathyroidectomy in regions with high prevalence of goitre? Acta Otorhinolaryngol Ital. 2013 Dec;33(6):388-92.
46. Berti P, Materazzi G, Picone A, Miccoli P. Limits and drawbacks of video-assisted parathyroidectomy. Br J Surg. 2003 Jun;90(6):743-7. doi: 10.1002/bjs.4183.
47. Barczyński M, Cichoń S, Konturek A, Cichoń W. Minimally invasive video-assisted parathyroidectomy versus open minimally invasive parathyroidectomy for a solitary parathyroid adenoma: a prospective, randomized, blinded trial. World J Surg. 2006 May;30(5):721-31. doi: 10.1007/s00268.005.0312-6.
48. Tolley N, Arora A, Palazzo F, Garas G, Dhawan R, Cox J, Darzi A. Robotic-assisted parathyroidectomy: a feasibility study. Otolaryngol Head Neck Surg. 2011 Jun;144(6):859-66. doi: 10.1177/019.459.9811402152. Epub 2011 May 5. PMID: 21546590.
49. Noureldine S.I., Murad F., Kandil E, Tufano R.P. (2017). Robotic Parathyroidectomy. In Stack, Jr. B.C., Bodenner D.L. (eds), Medical and Surgical Treatment of Parathyroid Diseases (pp.213-221). Little Rock, Springer.
50. Arora A, Garas G, Tolley N. Robotic Parathyroid Surgery: Current Perspectives and Future Considerations. ORL J Otorhinolaryngol Relat Spec. 2018;80(3-4):195-203. doi: 10.1159/000488355.
51. Shaha AR. Transoral parathyroidectomy-Why make a simple operation complicated? A surgical fantasy. Head Neck. 2019 Sep;41(9):3466-3467. doi: 10.1002/hed.25829.
52. Garas G, Holsinger FC, Grant DG, Athanasiou T, Arora A, Tolley N. Is robotic parathyroidectomy a feasible and safe alternative to targeted open parathyroidectomy for the treatment of primary hyperparathyroidism? Int J Surg. 2015 Mar;15:55-60. doi: 10.1016/j.ijsu.2015.01.019.
53. Hu J, Ngiam KY, Parameswaran R. Mediastinal parathyroid adenomas and their surgical implications. Ann R Coll Surg Engl. 2015 May;97(4):259-61. doi: 10.1308/003588415X141.812.54789088.
54. Sridhar P, Steenkamp DW, Lee SL, Ebright MI, Litle VR, Fernando HC. Mediastinal parathyroid adenoma with osteitis fibrosis cystica: robot-assisted thoracic surgical resection. Innovations (Phila). 2014 Nov-Dec;9(6):445-7. doi: 10.1097/IMI.000.000.0000000108.
55. Iacobone M, Mondi I, Viel G, Citton M, Tropea S, Frego M, Favia G. The results of surgery for mediastinal parathyroid tumors: a comparative study of 63 patients. Langenbecks Arch Surg. 2010 Sep;395(7):947-53. doi: 10.1007/s00423.010.0678-2.
56. Ramos R, Rivas F, Macía I, Escobar I, Ureña A. Robotic posterosuperior mediastinal parathyroid adenoma resection. Cir Esp (Engl Ed). 2021 Jun 14:S0009-739X(21)00168-8. English, Spanish. doi: 10.1016/j.ciresp.2021.04.020. Epub ahead of print.
57. Ruda JM, Hollenbeak CS, Stack BC Jr. A systematic review of the diagnosis and treatment of primary hyperparathyroidism from 1995 to 2003. Otolaryngol Head Neck Surg. 2005 Mar;132(3):359-72. doi: 10.1016/j.otohns.2004.10.005.
58. Barczyński M, Bränström R, Dionigi G, Mihai R. Sporadic multiple parathyroid gland disease--a consensus report of the European Society of Endocrine Surgeons (ESES). Langenbecks Arch Surg. 2015 Dec;400(8):887-905. doi: 10.1007/s00423.015.1348-1.
59. Stechman M, Bergenfeltz A, Scott-Coombes D. (2021). Surgical Management of Multiglandular Parathyroid Disease. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 553-563). Philadelphia, Elsevier.
60. Chan RK, Ruan DT, Gawande AA, Moore FD. Surgery for Hyperparathyroidism in Image-Negative Patients. Arch Surg. 2008;143(4):335–337. doi:10.1001/archsurg.143.4.335.
61. De Gregorio L, Lubitz CC, Hodin RA, Gaz RD, Parangi S, Phitayakorn R, Stephen AE. The Truth about Double Adenomas: Incidence, Localization, and Intraope-

rative Parathyroid Hormone. J Am Coll Surg. 2016 Jun;222(6):1044-52. doi: 10.1016/j.jamcollsurg.2015.12.048.
62. Goodsell KE, Ermer JP, Zaheer S, Kelz RR, Fraker DL, Wachtel H. Double adenoma as a cause of primary hyperparathyroidism: Asymmetric hyperplasia or a distinct pathologic entity? Am J Surg. 2021 Sep;222(3):483-489. doi: 10.1016/j.amjsurg.2021.01.021.
63. Russell CF, Dolan SJ, Laird JD. Randomized clinical trial comparing scan-directed unilateral versus bilateral cervical exploration for primary hyperparathyroidism due to solitary adenoma. Br J Surg. 2006 Apr;93(4):418-21. doi: 10.1002/bjs.5250.
64. Chan RK, Ibrahim SI, Pil P, Tanasijevic M, Moore FD. Validation of a method to replace frozen section during parathyroid exploration by using the rapid parathyroid hormone assay on parathyroid aspirates. Arch Surg. 2005 Apr;140(4):371-3. doi: 10.1001/archsurg.140.4.371.
65. Müller-Stich BP, Brändle M, Binet I, Warschkow R, Lange J, Clerici T. To autotransplant simultaneously or not – can intraoperative parathyroid hormone monitoring reliably predict early postoperative parathyroid hormone levels after total parathyroidectomy for hyperplasia? Surgery. 2007 Jul;142(1):47-56. doi: 10.1016/j.surg.2007.02.003.
66. Tominaga Y. (2021). Surgical Management of Secondary and Tertiary Hyperparathyroidism. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 564-575). Philadelphia, Elsevier.
67. Steinl GK, Kuo JH. Surgical Management of Secondary Hyperparathyroidism. Kidney Int Rep. 2020 Dec 30;6(2):254-264. doi: 10.1016/j.ekir.2020.11.023.
68. van der Plas WY, Engelsman AF, Özyilmaz A, van der Horst-Schrivers AN, Meijer K, van Dam GM, Pol RA, de Borst MH, Kruijff S. Impact of the Introduction of Calcimimetics on Timing of Parathyroidectomy in Secondary and Tertiary Hyperparathyroidism. Ann Surg Oncol. 2017 Jan;24(1):15-22. doi: 10.1245/s10434.016.5450-6.
69. Tominaga Y, Matsuoka S, Uno N, Sato T. Parathyroidectomy for secondary hyperparathyroidism in the era of calcimimetics. Ther Apher Dial. 2008;12(suppl 1):S21–S26.). DOI: 10.1111/j.1744-9987.2008.00627.x.
70. Habas E Sr, Eledrisi M, Khan F, Elzouki AY. Secondary Hyperparathyroidism in Chronic Kidney Disease: Pathophysiology and Management. Cureus. 2021 Jul 14;13(7):e16388. doi: 10.7759/cureus.16388.
71. Ketteler M, Block GA, Evenepoel P, Fukagawa M, Herzog CA, McCann L, Moe SM, Shroff R, Tonelli MA, Toussaint ND, Vervloet MG, Leonard MB. Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney Disease-Mineral and Bone Disorder: Synopsis of the Kidney Disease: Improving Global Outcomes 2017 Clinical Practice Guideline Update. Ann Intern Med. 2018 Mar 20;168(6):422-430. doi: 10.7326/M17-2640).
72. National Kidney Foundation. K/DOQI clinical practice guidelines for bone metabolism and disease in chronic kidney disease. Am J Kidney Dis. 2003 Oct;42(4 Suppl 3):S1-201. PMID: 14520607.
73. Fukagawa M, Yokoyama K, Koiwa F, Taniguchi M, Shoji T, Kazama JJ, Komaba H, Ando R, Kakuta T, Fujii H, Nakayama M, Shibagaki Y, Fukumoto S, Fujii N, Hattori M, Ashida A, Iseki K, Shigematsu T, Tsukamoto Y, Tsubakihara Y, Tomo T, Hirakata H, Akizawa T; CKD-MBD Guideline Working Group; Japanese Society for Dialysis Therapy. Clinical practice guideline for the management of chronic kidney disease-mineral and bone disorder. Ther Apher Dial. 2013 Jun;17(3):247-88. doi: 10.1111/1744-9987.12058.
74. Türkiye Endokrinoloji ve Metabolizma Derneği. (2020). Kronik Böbrek Hastalığında Kemik ve Mineral Metabolizması Bozuklukları. In: Osteoporoz ve Metabolik Kemik Hastalıkları Tanı ve Tedavi Kılavuzu.(pp. 161-170). Ankara. Bayt.
75. Akçay M.N. (2021). Hiperparatiroidiler. IN Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.29-35). Ankara, Türkiye Klinikleri.
76. Anderson K Jr, Ruel E, Adam MA, Thomas S, Youngwirth L, Stang MT, Scheri RP, Roman SA, Sosa JA. Subtotal vs. total parathyroidectomy with autotransplantation for patients with renal hyperparathyroidism have similar outcomes. Am J Surg. 2017 Nov;214(5):914-919. doi: 10.1016/j.amjsurg.2017.07.018.
77. Chen J, Jia X, Kong X, Wang Z, Cui M, Xu D. Total parathyroidectomy with autotransplantation versus subtotal parathyroidectomy for renal hyperparathyroidism: A systematic review and meta-analysis. Nephrology (Carlton). 2017 May;22(5):388-396. doi: 10.1111/nep.12801.).
78. Echenique-Elizondo M, Amondarain JA, Vidaur F, Olalla C, Aribe F, Garrido A, Molina J, Rodrigo MT. Parathyroid subcutaneous pre-sternal transplantation after parathyroidectomy for renal hyperparathyroidism. Long-term graft function. World J Surg. 2007 Jul;31(7):1403-9. doi: 10.1007/s00268.007.9092-5.
79. van der Plas W, Kruijff S, Sidhu SB, Delbridge LW, Sywak MS, Engelsman AF. Parathyroidectomy for patients with secondary hyperparathyroidism in a changing landscape for the management of end-stage renal disease. Surgery. 2021 Feb;169(2):275-281. doi: 10.1016/j.surg.2020.08.014.
80. Hibi Y, Tominaga Y, Uchida K, Takagi H, Imai T, Funahashi H, Nakao A. Cases with fewer than four parathyroid glands in patients with renal hyperparathyroidism at initial parathyroidectomy. World J Surg. 2002 Mar;26(3):314-7. doi: 10.1007/s00268.001.0224-z.
81. Shepet K, Alhefdhi A, Usedom R, Sippel R, Chen H. Parathyroid cryopreservation after parathyroidectomy: a worthwhile practice? Ann Surg Oncol. 2013 Jul;20(7):2256-60. doi: 10.1245/s10434.013.2941-6.
82. Fei M, Xu D, Lai Y, Xu Y, Zhang J, Wang J. Comparison of different parathyroid autograft project after total parathyroidectomy in patients with secondary hyperpa-

rathyroidism. Am J Otolaryngol. 2021 Nov-Dec;42(6):103085. doi: 10.1016/j.amjoto.2021.103085.
83. Sabeel A, Al-Homrany M. Complete resorption of massive soft tissue calcification in a hemodialysis patient after parathyroidectomy. Am J Nephrol. 2000 Sep-Oct;20(5):421-4. doi: 10.1159/000013630.
84. Guideline Working Group, Japanese Society for Dialysis Therapy. Clinical practice guideline for the management of secondary hyperparathyroidism in chronic dialysis patients. Ther Apher Dial. 2008 Dec;12(6):514-25. doi: 10.1111/j.1744-9987.2008.00648.x.
85. Matsuoka S, Tominaga Y, Sato T, Uno N, Goto N, Katayama A, Uchida K, Takami H. QuiCk-IntraOperative Bio-Intact PTH assay at parathyroidectomy for secondary hyperparathyroidism. World J Surg. 2007 Apr;31(4):824-31. doi: 10.1007/s00268.006.0601-8.
86. Silveira AA, Brescia MDG, Nascimento CPD Jr, Arap SS, Montenegro FLM. Delayed sampling of intraoperative parathormone may be unnecessary during parathyroidectomy in kidney-transplanted and dialysis patients. J Bras Nefrol. 2021 Apr-Jun;43(2):228-235. doi: 10.1590/2175-8239-JBN-2020-0108.
87. Joliat GR, Guarnero V, Demartines N, Schweizer V, Matter M. Recurrent laryngeal nerve injury after thyroid and parathyroid surgery: Incidence and postoperative evolution assessment. Medicine (Baltimore). 2017 Apr;96(17):e6674. doi: 10.1097/MD.000.000.0000006674.
88. Ghani U, Assad S, Assad S. Role of Intraoperative Nerve Monitoring During Parathyroidectomy to Prevent Recurrent Laryngeal Nerve Injury. Cureus. 2016 Nov 15;8(11):e880. doi: 10.7759/cureus.880.
89. Habas E Sr, Eledrisi M, Khan F, Elzouki AY. Secondary Hyperparathyroidism in Chronic Kidney Disease: Pathophysiology and Management. Cureus. 2021 Jul 14;13(7):e16388. doi: 10.7759/cureus.16388.
90. Witteveen JE, van Thiel S, Romijn JA, Hamdy NA. Hungry bone syndrome: still a challenge in the post-operative management of primary hyperparathyroidism: a systematic review of the literature. Eur J Endocrinol. 2013 Feb 20;168(3):R45-53. doi: 10.1530/EJE-12-0528.
91. Tentori F, Wang M, Bieber BA, Karaboyas A, Li Y, Jacobson SH, Andreucci VE, Fukagawa M, Frimat L, Mendelssohn DC, Port FK, Pisoni RL, Robinson BM. Recent changes in therapeutic approaches and association with outcomes among patients with secondary hyperparathyroidism on chronic hemodialysis: the DOPPS study. Clin J Am Soc Nephrol. 2015 Jan 7;10(1):98-109. doi: 10.2215/CJN.12941213.
92. Portillo MR, Rodríguez-Ortiz ME. Secondary Hyperparthyroidism: Pathogenesis, Diagnosis, Preventive and Therapeutic Strategies. Rev Endocr Metab Disord. 2017 Mar;18(1):79-95. doi: 10.1007/s11154.017.9421-4.
93. Rodríguez-Ortiz ME, Rodríguez M. Recent advances in understanding and managing secondary hyperparathyroidism in chronic kidney disease. F1000Res. 2020 Sep 1;9:F1000 Faculty Rev-1077. doi: 10.12688/f1000research.22636.1.
94. Hsu YH, Chen HJ, Shen SC, Tsai WC, Hsu CC, Kao CH. Reduced Stroke Risk After Parathyroidectomy in End-Stage Renal Disease: A 13-Year Population-Based Cohort Study. Medicine (Baltimore). 2015 Jun;94(23):e936. doi: 10.1097/MD.000.000.0000000936.
95. İşgör A. (2006). Tersiyer hiperparatiroidizm. In İşgör A. (ed), Paratiroit Hastalıkları ve Cerrahisi. (pp.289-299). İstanbul, Avrupa Tıp Kitapçılık.
96. Ghanekar H, Welch BJ, Moe OW, Sakhaee K. Post-renal transplantation hypophosphatemia: a review and novel insights. Curr Opin Nephrol Hypertens. 2006 Mar;15(2):97-104. doi: 10.1097/01.mnh.000.020.3187.49890.cc.
97. Lou I, Schneider DF, Leverson G, Foley D, Sippel R, Chen H. Parathyroidectomy is underused in patients with tertiary hyperparathyroidism after renal transplantation. Surgery. 2016 Jan;159(1):172-9. doi: 10.1016/j.surg.2015.08.039.
98. Delos Santos R, Rossi A, Coyne D, Maw TT. Management of Post-transplant Hyperparathyroidism and Bone Disease. Drugs. 2019 Apr;79(5):501-513. doi: 10.1007/s40265.019.01074-4. /
99. Dulfer RR, Koh EY, van der Plas WY, Engelsman AF, van Dijkum EJMN, Pol RA, Vogt L, de Borst MH, Kruijff S, Schepers A, Appelman-Dijkstra NM, Rotmans JI, Hesselink DA, van Eijck CHJ, Hoorn EJ, van Ginhoven TM; Dutch Hyperparathyroid Study Group. Parathyroidectomy versus cinacalcet for tertiary hyperparathyroidism; a retrospective analysis. Langenbecks Arch Surg. 2019 Feb;404(1):71-79. doi: 10.1007/s00423.019.01755-4.
100. Akerström G, Stålberg P. Surgical management of MEN-1 and – 2: state of the art. Surg Clin North Am. 2009 Oct;89(5):1047-68. doi: 10.1016/j.suc.2009.06.016. ///
101. Thakker RV, Newey PJ, Walls GV, Bilezikian J, Dralle H, Ebeling PR, Melmed S, Sakurai A, Tonelli F, Brandi ML; Endocrine Society. Clinical practice guidelines for multiple endocrine neoplasia type 1 (MEN1). J Clin Endocrinol Metab. 2012 Sep;97(9):2990-3011. doi: 10.1210/jc.2012-1230.
102. Stålberg P, Carling T. Familial parathyroid tumors: diagnosis and management. World J Surg. 2009 Nov;33(11):2234-43. doi: 10.1007/s00268.009.9924-6.
103. Wang TS, Evans DB. Parathyroid Management in the MEN Syndromes. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 576-584). Philadelphia, Elsevier.
104. Lambert LA, Shapiro SE, Lee JE, Perrier ND, Truong M, Wallace MJ, Hoff AO, Gagel RF, Evans DB. Surgical treatment of hyperparathyroidism in patients with multiple endocrine neoplasia type 1. Arch Surg. 2005 Apr;140(4):374-82. doi: 10.1001/archsurg.140.4.374.
105. Tonelli F, Marcucci T, Giudici F, Falchetti A, Brandi ML. Surgical approach in hereditary hyperparathyroidism. Endocr J. 2009;56(7):827-41. doi: 10.1507/endocrj.k09e-204.
106. Nastos C, Papaconstantinou D, Kofopoulos-Lymperis E, Peppa

M, Pikoulis A, Lykoudis P, Palazzo F, Patapis P, Pikoulis E. Optimal extent of initial parathyroid resection in patients with multiple endocrine neoplasia syndrome type 1: A meta-analysis. Surgery. 2021 Feb;169(2):302-310. doi: 10.1016/j.surg.2020.08.021.

107. Nilubol N, Weinstein LS, Simonds WF, Jensen RT, Marx SJ, Kebebew E. Limited Parathyroidectomy in Multiple Endocrine Neoplasia Type 1-Associated Primary Hyperparathyroidism: A Setup for Failure. Ann Surg Oncol. 2016 Feb;23(2):416-23. doi: 10.1245/s10434.015.4865-9.
108. Horiuchi K, Sakurai M, Haniu K, Nagai E, Tokumitsu H, Yoshida Y, Omi Y, Sakamoto A, Okamoto T. Impact of "Tailored" Parathyroidectomy for Treatment of Primary Hyperparathyroidism in Patients with Multiple Endocrine Neoplasia Type 1. World J Surg. 2018 Jun;42(6):1772-1778. doi: 10.1007/s00268.017.4366-z.).
109. Salmeron MD, Gonzalez JM, Sancho Insenser J, Goday A, Perez NM, Zambudio AR, Paricio PP, Serra AS. Causes and treatment of recurrent hyperparathyroidism after subtotal parathyroidectomy in the presence of multiple endocrine neoplasia 1. World J Surg. 2010 Jun;34(6):1325-31. doi: 10.1007/s00268.010.0605-2. Erratum in: World J Surg. 2010 Jul;34(7):1739. Fornos, Joan Sancho [corrected to Sancho Insenser, Joan].
110. Tonelli F, Marcucci T, Fratini G, Tommasi MS, Falchetti A, Brandi ML. Is total parathyroidectomy the treatment of choice for hyperparathyroidism in multiple endocrine neoplasia type 1? Ann Surg. 2007 Dec;246(6):1075-82. doi: 10.1097/SLA.0b013e31811f4467.
111. Montenegro FL, Lourenço DM Jr, Tavares MR, Arap SS, Nascimento CP Jr, Massoni Neto LM, D'Alessandro A, Toledo RA, Coutinho FL, Brandão LG, de Britto e Silva Filho G, Cordeiro AC, Toledo SP. Total parathyroidectomy in a large cohort of cases with hyperparathyroidism associated with multiple endocrine neoplasia type 1: experience from a single academic center. Clinics (Sao Paulo). 2012;67 Suppl 1(Suppl 1):131-9. doi: 10.6061/clinics/2012(sup01)22.).
112. Wells SA Jr, Asa SL, Dralle H, Elisei R, Evans DB, Gagel RF, Lee N, Machens A, Moley JF, Pacini F, Raue F, Frank-Raue K, Robinson B, Rosenthal MS, Santoro M, Schlumberger M, Shah M, Waguespack SG; American Thyroid Association Guidelines Task Force on Medullary Thyroid Carcinoma. Revised American Thyroid Association guidelines for the management of medullary thyroid carcinoma. Thyroid. 2015 Jun;25(6):567-610. doi: 10.1089/thy.2014.0335/ /
113. Stålberg P, Carling T. Familial parathyroid tumors: diagnosis and management. World J Surg. 2009 Nov;33(11):2234-43. doi: 10.1007/s00268.009.9924-6.
114. Chang RYK, Lang BHH.(2021). Parathyroid Carcinoma. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 591-596). Philadelphia, Elsevier.
115. Asare EA, Sturgeon C, Winchester DJ, Liu L, Palis B, Perrier ND, Evans DB, Winchester DP, Wang TS. Parathyroid Carcinoma: An Update on Treatment Outcomes and Prognostic Factors from the National Cancer Data Base (NCDB). Ann Surg Oncol. 2015 Nov;22(12):3990-5. doi: 10.1245/s10434.015.4672-3.
116. Hsu KT, Sippel RS, Chen H, Schneider DF. Is central lymph node dissection necessary for parathyroid carcinoma? Surgery. 2014 Dec;156(6):1336-41; discussion 1341. doi: 10.1016/j.surg.2014.08.005.
117. Lee PK, Jarosek SL, Virnig BA, Evasovich M, Tuttle TM. Trends in the incidence and treatment of parathyroid cancer in the United States. Cancer. 2007 May 1;109(9):1736-41. doi: 10.1002/cncr.22599.
118. Wei CH, Harari A. Parathyroid carcinoma: update and guidelines for management. Curr Treat Options Oncol. 2012 Mar;13(1):11-23. doi: 10.1007/s11864.011.0171-3.
119. Yıldız R, Gül VO. (2021). Paratiroid kanserleri. IN Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.94-99). Ankara, Türkiye Klinikleri.
120. Kebebew E, Arici C, Duh QY, Clark OH. Localization and reoperation results for persistent and recurrent parathyroid carcinoma. Arch Surg. 2001 Aug;136(8):878-85. doi: 10.1001/archsurg.136.8.878.
121. Yu HH, Lou SY, Chou YH, Chan HM, Chen HT, Huang SM. Hyperparathyroid crisis: the timing of surgery. Asian J Surg. 2011 Oct;34(4):147-52. doi: 10.1016/j.asjsur.2011.11.004. Epub 2012 Feb 24.
122. Singh DN, Gupta SK, Kumari N, Krishnani N, Chand G, Mishra A, Agarwal G, Verma AK, Mishra SK, Agarwal A. Primary hyperparathyroidism presenting as hypercalcemic crisis: Twenty-year experience. Indian J Endocrinol Metab. 2015 Jan-Feb;19(1):100-5. doi: 10.4103/2230-8210.131763.
123. Doğru O, Kargın S. (2021). Akut paratiroid krizi. IN Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.44-46). Ankara, Türkiye Klinikleri.
124. 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.
125. Akcan A. (2021). Paratiroid Cerrahisinde Başarısızlıklar ve Persistant Hiperparatiroidizm. IN Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.67-77). Ankara, Türkiye Klinikleri.
126. Singer MC, Iwata A., Stack, Jr BC. (2021). Revision Parathyroid Surgery. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 585-590). Philadelphia, Elsevier.
127. McIntyre CJ, Allen JL, Constantinides VA, Jackson JE, Tolley NS, Palazzo FF. Patterns of disease in patients at a tertiary referral centre requiring reoperative parathyroidectomy. Ann R Coll Surg Engl. 2015 Nov;97(8):598-602. doi: 10.1308/rcsann.2015.0039.
128. Nawrot I, Chudziński W, Ciąćka T, Barczyński M, Szmidt J. Reoperations for persistent or recurrent primary hyperparathyroidism: results of a retrospective cohort study at a tertiary referral center. Med Sci Monit. 2014

Sep 9;20:1604-12. doi: 10.12659/MSM.890983.
129. Stack BC Jr, Tolley NS, Bartel TB, Bilezikian JP, Bodenner D, Camacho P, Cox JPDT, Dralle H, Jackson JE, Morris JC 3rd, Orloff LA, Palazzo F, Ridge JA, Scott-Coombes D, Steward DL, Terris DJ, Thompson G, Randolph GW. 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.
130. Camenzuli C, DiMarco AN, Isaacs KE, Grant Y, Jackson J, Alsafi A, Harvey C, Barwick TD, Tolley N, Palazzo FF. The changing face of reoperative parathyroidectomy: a single-centre comparison of 147 parathyroid reoperations. Ann R Coll Surg Engl. 2021 Jan;103(1):29-34. doi: 10.1308/rcsann.2020.0185.
131. Guerin C, Paladino NC, Lowery A, Castinetti F, Taieb D, Sebag F. Persistent and recurrent hyperparathyroidism. Updates Surg. 2017 Jun;69(2):161-169. doi: 10.1007/s13304.017.0447-7.
132. Palmer JA, Brown WA, Kerr WH, Rosen IB, Watters NA. The surgical aspects of hyperparathyroidism. Arch Surg. 1975 Aug;110(8):1004-7. doi: 10.1001/archsurg.1975.013.60140148028.
133. Reddick RL, Costa JC, Marx SJ. Parathyroid hyperplasia and parathyromatosis. Lancet. 1977 Mar 5;1(8010):549. doi: 10.1016/s0140-6736(77)91414-3.
134. Jain M, Krasne DL, Singer FR, Giuliano AE. Recurrent primary hyperparathyroidism due to Type 1 parathyromatosis. Endocrine. 2017 Feb;55(2):643-650. doi: 10.1007/s12020.016.1139-7.
135. Demirel K, Filiz Aİ.(2021). Paratiroid cerrahisinde intraoperatif lokalizasyon yöntemleri. In Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.83-89). Ankara, Türkiye Klinikleri.
136. Carneiro-Pla D., Pellitteri P.K. (2021). Intraoperative PTH Monitoring During Parathyroid Surgery. In Randolph G.W. (Ed), Surgery of the Thyroid and Parathyroid Glands (3rd ed, pp. 546-552). Philadelphia, Elsevier.
137. Baj J, Sitarz R, Łokaj M, Forma A, Czeczelewski M, Maani A, Garruti G. Preoperative and Intraoperative Methods of Parathyroid Gland Localization and the Diagnosis of Parathyroid Adenomas. Molecules. 2020 Apr 9;25(7):1724. doi: 10.3390/molecules25071724.
138. Greene AB, Butler RS, McIntyre S, Barbosa GF, Mitchell J, Berber E, Siperstein A, Milas M. National trends in parathyroid surgery from 1998 to 2008: a decade of change. J Am Coll Surg. 2009 Sep;209(3):332-43. doi: 10.1016/j.jamcollsurg.2009.05.029.
139. Irvin GL 3rd. American Association of Endocrine Surgeons. Presidential address: chasin' hormones. Surgery. 1999 Dec;126(6):993-7.
140. Naik AH, Wani MA, Wani KA, Laway BA, Malik AA, Shah ZA. Intraoperative Parathyroid Hormone Monitoring in Guiding Adequate Parathyroidectomy. Indian J Endocrinol Metab. 2018 May-Jun;22(3):410-416. doi: 10.4103/ijem.IJEM_678_17.
141. Goldfarb M, Singer FR. Recent advances in the understanding and management of primary hyperparathyroidism. F1000Res. 2020 Feb 25;9:F1000 Faculty Rev-143. doi: 10.12688/f1000research.21569.1.
142. Khan ZF, Lew JI. Intraoperative Parathyroid Hormone Monitoring in the Surgical Management of Sporadic Primary Hyperparathyroidism. Endocrinol Metab (Seoul). 2019 Dec;34(4):327-339. doi: 10.3803/EnM.2019.34.4.327.
143. Weber T, Zeier M, Hinz U, Schilling T, Büchler MW. Impact of intraoperative parathyroid hormone levels on surgical results in patients with renal hyperparathyroidism. World J Surg. 2005 Sep;29(9):1176-9. doi: 10.1007/s00268.005.7805-1.
144. Thanasoulis L, Bingener J, Sirinek K, Richards M. A successful application of the intraoperative parathyroid hormone assay in tertiary hyperparathyroidism. Am Surg. 2007 Mar;73(3):281-3.
145. Barczynski M, Konturek A, Hubalewska-Dydejczyk A, Cichon S, Nowak W. Evaluation of Halle, Miami, Rome, and Vienna intraoperative iPTH assay criteria in guiding minimally invasive parathyroidectomy. Langenbecks Arch Surg 2009;394:843-9.
146. Barczynski M, Konturek A, Hubalewska-Dydejczyk A, Cichon S, Nowak W. Utility of intraoperative bilateral internal jugular venous sampling with rapid parathyroid hormone testing in guiding patients with a negative sestamibi scan for minimally invasive parathyroidectomy--a randomized controlled trial. Langenbecks Arch Surg. 2009 Sep;394(5):827-35. doi: 10.1007/s00423.009.0516-6.
147. Aygün N, Uludağ M. Intraoperative Adjunct Methods for Localization in Primary Hyperparathyroidism. Sisli Etfal Hastan Tip Bul. 2019 Jul 11;53(2):84-95. doi: 10.14744/SEMB.2019.37542.
148. Perrier ND, Ituarte P, Kikuchi S, Siperstein AE, Duh QY, Clark OH, Gielow R, Hamill T. Intraoperative parathyroid aspiration and parathyroid hormone assay as an alternative to frozen section for tissue identification. World J Surg. 2000 Nov;24(11):1319-22. doi: 10.1007/s002.680.010218.
149. Doppman JL, Krudy AG, Marx SJ, Saxe A, Schneider P, Norton JA, Spiegel AM, Downs RW, Schaaf M, Brennan ME, Schneider AB, Aurbach GD. Aspiration of enlarged parathyroid glands for parathyroid hormone assay. Radiology. 1983 Jul;148(1):31-5. doi: 10.1148/radiology.148.1.6856859).
150. Carneiro DM, Solorzano CC, Nader MC, Ramirez M, Irvin GL 3rd.Comparison of intraoperative iPTH assay (QPTH) criteria in guiding parathyroidectomy: which criterion is the most accurate? Surgery. 2003;134(6):973–979; discussion 980–981.
151. Patel KN, Caso R. Intraoperative Parathyroid Hormone Monitoring: Optimal Utilization. Surg Oncol Clin N Am. 2016 Jan;25(1):91-101. doi: 10.1016/j.soc.2015.08.005.
152. Anton RC, Wheeler TM. Frozen section of thyroid and parathyroid specimens. Arch Pathol Lab Med.

2005 Dec;129(12):1575-84. doi: 10.5858/2005.129.1575-FSOTAP.
153. Dewan AK, Kapadia SB, Hollenbeak CS, Stack BC Jr. Is routine frozen section necessary for parathyroid surgery? Otolaryngol Head Neck Surg. 2005 Dec;133(6):857-62. doi: 10.1016/j.otohns.2005.05.001.
154. Harrison BJ, Triponez F. Intraoperative adjuncts in surgery for primary hyperparathyroidism. Langenbecks Arch Surg. 2009 Sep;394(5):799-809. doi: 10.1007/s00423.009.0532-6.
155. Mazeh H, Chen H. Intraoperative adjuncts for parathyroid surgery. Expert Rev Endocrinol Metab. 2011 Mar;6(2):245-253. doi: 10.1586/eem.11.1.
156. Osamura RY, Hunt JL. Current practices in performing frozen sections for thyroid and parathyroid pathology. Virchows Arch. 2008 Nov;453(5):433-40. doi: 10.1007/s00428.008.0674-x.
157. Li J, Vasilyeva E, Hiebert J, Britton H, Walker B, Wiseman SM. Limited clinical utility of intraoperative frozen section during parathyroidectomy for treatment of primary hyperparathyroidism. Am J Surg. 2019 May;217(5):893-898. doi: 10.1016/j.amjsurg.2019.01.032.
158. Li R.J., Orloff L.A. (2017). Intraoperative Parathyroid Ultrasound. In Stack, Jr. B.C., Bodenner D.L. (eds), Medical and Surgical Treatment of Parathyroid Diseases (pp.257-269). Little Rock, Springer.
159. Zhao W, Lu R, Yin L, Wei B, Jin M, Zhang C, Guo R, Lv X. The Value of Preoperative and Intraoperative Ultrasound in the Localization of Intrathyroidal Parathyroid Adenomas. J Invest Surg. 2021 Jun 24:1-6. doi: 10.1080/08941.939.2021.1933273.
160. Xia C, Zhu Q, Li Z, Hu M, Fang J, Zhong Q, Yue C, Bai Y. Study of the Ultrasound Appearance of the Normal Parathyroid Using an Intraoperative Procedure. J Ultrasound Med. 2019 Feb;38(2):321-327. doi: 10.1002/jum.14691.
161. Prescott JD, Udelsman R. Remedial operation for primary hyperparathyroidism. World J Surg. 2009 Nov;33(11):2324-34. doi: 10.1007/s00268.009.9962-0.
162. Ladurner R, Hallfeldt KK, Al Arabi N, Stepp H, Mueller S, Gallwas JK. Optical coherence tomography as a method to identify parathyroid glands. Lasers Surg Med. 2013 Dec;45(10):654-9. doi: 10.1002/lsm.22195.
163. Rubinstein M, Hu AC, Chung PS, Kim JH, Osann KE, Schalch P, Armstrong WB, Wong BJF. Intraoperative use of optical coherence tomography to differentiate normal and diseased thyroid and parathyroid tissues from lymph node and fat. Lasers Med Sci. 2021 Mar;36(2):269-278. doi: 10.1007/s10103.020.03024-z.
164. Ladurner R, Hallfeldt K, Al Arabi N, Gallwas J, Mortensen U, Sommerey S. Optische Kohärenztomographie als Verfahren zur Differenzierung von Nebenschilddrüsengewebe [Optical coherence tomography for differentiation of parathyroid gland tissue]. Chirurg. 2016 May;87(5):416-22. German. doi: 10.1007/s00104.015.0120-y.
165. Das K, Stone N, Kendall C, Fowler C, Christie-Brown J. Raman spectroscopy of parathyroid tissue pathology. Lasers Med Sci. 2006 Dec;21(4):192-7. doi: 10.1007/s10103.006.0397-7.
166. Palermo A, Fosca M, Tabacco G, Marini F, Graziani V, Santarsia MC, Longo F, Lauria A, Cesareo R, Giovannoni I, Taffon C, Rocchia M, Manfrini S, Crucitti P, Pozzilli P, Crescenzi A, Rau JV. Raman Spectroscopy Applied to Parathyroid Tissues: A New Diagnostic Tool to Discriminate Normal Tissue from Adenoma. Anal Chem. 2018 Jan 2;90(1):847-854. doi: 10.1021/acs.analchem.7b03617.
167. Mannoh EA, Thomas G, Solórzano CC, Mahadevan-Jansen A. Intraoperative Assessment of Parathyroid Viability using Laser Speckle Contrast Imaging. Sci Rep. 2017 Nov 1;7(1):14798. doi: 10.1038/s41598.017.14941-5.
168. Kazmi SM, Faraji E, Davis MA, Huang YY, Zhang XJ, Dunn AK. Flux or speed? Examining speckle contrast imaging of vascular flows. Biomed Opt Express. 2015 Jun 18;6(7):2588-608. doi: 10.1364/BOE.6.002588.
169. Kirkpatrick SJ, Duncan DD, Wells-Gray EM. Detrimental effects of speckle-pixel size matching in laser speckle contrast imaging. Opt Lett. 2008 Dec 15;33(24):2886-8. doi: 10.1364/ol.33.002886.
170. Kim IA, Taylor ZD, Cheng H, Sebastian C, Maccabi A, Garritano J, Tajudeen B, Razfar A, Palma Diaz F, Yeh M, Stafsudd O, Grundfest W, St John M. Dynamic Optical Contrast Imaging. Otolaryngol Head Neck Surg. 2017 Mar;156(3):480-483. doi: 10.1177/019.459.9816686294.
171. Abbaci M, De Leeuw F, Breuskin I, Casiraghi O, Lakhdar AB, Ghanem W, Laplace-Builhé C, Hartl D. Parathyroid gland management using optical technologies during thyroidectomy or parathyroidectomy: A systematic review. Oral Oncol. 2018 Dec;87:186-196. doi: 10.1016/j.oraloncology.2018.11.011.
172. Paras C, Keller M, White L, Phay J, Mahadevan-Jansen A. Near-infrared autofluorescence for the detection of parathyroid glands. J Biomed Opt. 2011 Jun;16(6):067012. doi: 10.1117/1.3583571.
173. Ladurner R, Sommerey S, Arabi NA, Hallfeldt KKJ, Stepp H, Gallwas JKS. Intraoperative near-infrared autofluorescence imaging of parathyroid glands. Surg Endosc. 2017 Aug;31(8):3140-3145. doi: 10.1007/s00464.016.5338-3.
174. Kim SW, Song SH, Lee HS, Noh WJ, Oak C, Ahn YC, Lee KD. Intraoperative Real-Time Localization of Normal Parathyroid Glands With Autofluorescence Imaging. J Clin Endocrinol Metab. 2016 Dec;101(12):4646-4652. doi: 10.1210/jc.2016-2558.
175. Kahramangil B, Berber E. The use of near-infrared fluorescence imaging in endocrine surgical procedures. J Surg Oncol. 2017 Jun;115(7):848-855. doi: 10.1002/jso.24583.
176. Thomas G, McWade MA, Paras C, Mannoh EA, Sanders ME, White LM, Broome JT, Phay JE, Baregamian N, Solórzano CC, Mahadevan-Jansen A. Developing a Clinical Prototype to Guide Surgeons for Intraoperative Label-Free Identification of Parathyroid Glands in Real Time. Thyroid. 2018 Nov;28(11):1517-1531.

doi: 10.1089/thy.2017.0716.
177. Cui L, Gao Y, Yu H, Li M, Wang B, Zhou T, Hu Q. Intraoperative Parathyroid Localization with Near-Infrared Fluorescence Imaging Using Indocyanine Green during Total Parathyroidectomy for Secondary Hyperparathyroidism. Sci Rep. 2017 Aug 15;7(1):8193. doi: 10.1038/s41598.017.08347-6.
178. Thomas G, Solórzano CC, Baregamian N, Mannoh EA, Gautam R, Irlmeier RT, Ye F, Nelson JA, Long SE, Gauger PG, Magner A, Metcalf T, Shirley LA, Phay JE, Mahadevan-Jansen A. Comparing intraoperative parathyroid identification based on surgeon experience versus near infrared autofluorescence detection – A surgeon-blinded multi-centric study. Am J Surg. 2021 Nov;222(5):944-951. doi: 10.1016/j.amjsurg.2021.05.001.
179. Kim SW, Lee HS, Ahn YC, Park CW, Jeon SW, Kim CH, Ko JB, Oak C, Kim Y, Lee KD. Near-Infrared Autofluorescence Image-Guided Parathyroid Gland Mapping in Thyroidectomy. J Am Coll Surg. 2018 Feb;226(2):165-172. doi: 10.1016/j.jamcollsurg.2017.10.015.
180. McWade MA, Thomas G, Nguyen JQ, Sanders ME, Solórzano CC, Mahadevan-Jansen A. Enhancing Parathyroid Gland Visualization Using a Near Infrared Fluorescence-Based Overlay Imaging System. J Am Coll Surg. 2019 May;228(5):730-743. doi: 10.1016/j.jamcollsurg.2019.01.017.
181. Kose E, Kahramangil B, Aydin H, Donmez M, Berber E. Heterogeneous and low-intensity parathyroid autofluorescence: Patterns suggesting hyperfunction at parathyroid exploration. Surgery. 2019 Feb;165(2):431-437. doi: 10.1016/j.surg.2018.08.006.
182. Henegan J, McGrath S, Shah K, Bendinelli C. On the use of autofluorescence for detection of intrathyroidal parathyroid adenoma. ANZ J Surg. 2020 May;90(5):916-917. doi: 10.1111/ans.15425.
183. Lang BH, Wong CK, Hung HT, Wong KP, Mak KL, Au KB. Indocyanine green fluorescence angiography for quantitative evaluation of in situ parathyroid gland perfusion and function after total thyroidectomy. Surgery. 2017 Jan;161(1):87-95. doi: 10.1016/j.surg.2016.03.037.
184. Rudin AV, McKenzie TJ, Thompson GB, Farley DR, Lyden ML. Evaluation of Parathyroid Glands with Indocyanine Green Fluorescence Angiography After Thyroidectomy. World J Surg. 2019 Jun;43(6):1538-1543. doi: 10.1007/s00268.019.04909-z.
185. Razavi AC, Ibraheem K, Haddad A, Saparova L, Shalaby H, Abdelgawad M, Kandil E. Efficacy of indocyanine green fluorescence in predicting parathyroid vascularization during thyroid surgery. Head Neck. 2019 Sep;41(9):3276-3281. doi: 10.1002/hed.25837.
186. Zaidi N, Bucak E, Okoh A, Yazici P, Yigitbas H, Berber E. The utility of indocyanine green near infrared fluorescent imaging in the identification of parathyroid glands during surgery for primary hyperparathyroidism. J Surg Oncol. 2016 Jun;113(7):771-4. doi: 10.1002/jso.24240.
187. Chakedis JM, Maser C, Brumund KT, Bouvet M. Indocyanine green fluorescence-guided redo parathyroidectomy. BMJ Case Rep. 2015 Sep 2;2015:bcr201.521.1778. doi: 10.1136/bcr-2015-211778.
188. Spartalis E, Ntokos G, Georgiou K, Zografos G, Tsourouflis G, Dimitroulis D, Nikiteas NI. Intraoperative Indocyanine Green (ICG) Angiography for the Identification of the Parathyroid Glands: Current Evidence and Future Perspectives. In Vivo. 2020 Jan-Feb;34(1):23-32. doi: 10.21873/invivo.11741.
189. DeLong JC, Ward EP, Lwin TM, Brumund KT, Kelly KJ, Horgan S, Bouvet M. Indocyanine green fluorescence-guided parathyroidectomy for primary hyperparathyroidism. Surgery. 2018 Feb;163(2):388-392. doi: 10.1016/j.surg.2017.08.018.
190. Demirel K, Filiz Aİ.(2021). Paratiroid cerrahisinde intraoperatif lokalizasyon yöntemleri. In Kanat B.H., Ünal B. (Eds), Paratiroid Hastalıkları ve Cerrahisi (1st ed, pp.83-89). Ankara, Türkiye Klinikleri.
191. Spartalis E, Ntokos G, Georgiou K, Zografos G, Tsourouflis G, Dimitroulis D, Nikiteas NI. Intraoperative Indocyanine Green (ICG) Angiography for the Identification of the Parathyroid Glands: Current Evidence and Future Perspectives. In Vivo. 2020 Jan-Feb;34(1):23-32. doi: 10.21873/invivo.11741.
192. Di Meo G, Karampinis I, Gerken A, Lammert A, Pellicani S, Nowak K. Indocyanine Green Fluorescence Angiography Can Guide Intraoperative Localization During Parathyroid Surgery. Scand J Surg. 2021 Mar;110(1):59-65. doi: 10.1177/145.749.6919877581.
193. Sound S, Okoh A, Yigitbas H, Yazici P, Berber E. Utility of Indocyanine Green Fluorescence Imaging for Intraoperative Localization in Reoperative Parathyroid Surgery. Surg Innov. 2019 Dec;26(6):774-779. doi: 10.1177/155.335.0615613450.
194. Takeuchi S, Shimizu K, Shimizu K Jr, Akasu H, Okamura R. Identification of pathological and normal parathyroid tissue by fluorescent labeling with 5-aminolevulinic acid during endocrine neck surgery. J Nippon Med Sch. 2014;81(2):84-93. doi: 10.1272/jnms.81.84.
195. Prosst RL, Weiss J, Hupp L, Willeke F, Post S. Fluorescence-guided minimally invasive parathyroidectomy: clinical experience with a novel intraoperative detection technique for parathyroid glands. World J Surg. 2010 Sep;34(9):2217-22. doi: 10.1007/s00268.010.0621-2.
196. Suzuki T, Numata T, Shibuya M. Intraoperative photodynamic detection of normal parathyroid glands using 5-aminolevulinic acid. Laryngoscope. 2011 Jul;121(7):1462-6. doi: 10.1002/lary.21857.).
197. Tummers QR, Schepers A, Hamming JF, Kievit J, Frangioni JV, van de Velde CJ, Vahrmeijer AL. Intraoperative guidance in parathyroid surgery using near-infrared fluorescence imaging and low-dose Methylene Blue. Surgery. 2015 Nov;158(5):1323-30. doi: 10.1016/j.surg.2015.03.027.
198. Hillary SL, Guillermet S, Brown NJ, Balasubramanian SP. Use of methylene blue and near-infrared fluorescence in thyroid and parat-

hyroid surgery. Langenbecks Arch Surg. 2018 Feb;403(1):111-118. doi: 10.1007/s00423.017.1641-2.
199. Patel HP, Chadwick DR, Harrison BJ, Balasubramanian SP. Systematic review of intravenous methylene blue in parathyroid surgery. Br J Surg. 2012 Oct;99(10):1345-51. doi: 10.1002/bjs.8814.
200. Candell L, Campbell MJ, Shen WT, Gosnell JE, Clark OH, Duh QY. Ultrasound-guided methylene blue dye injection for parathyroid localization in the reoperative neck. World J Surg. 2014 Jan;38(1):88-91. doi: 10.1007/s00268.013.2234-z.
201. Haciyanli M, Koruyucu MB, Erdoğan NK, Dere O, Sarı E, Kumkumoğlu Y, Tavusbay C, Kamer E. Successful Localization of Abnormal Parathyroid Gland Using Ultrasound-Guided Methylene Blue Dye Injection in the Reoperative Neck. Indian J Surg. 2015 Dec;77(-Suppl 3):1094-7. doi: 10.1007/s12262.014.1172-9
202. Harari A, Sippel RS, Goldstein R, Aziz S, Shen W, Gosnell J, Duh QY, Clark OH. Successful localization of recurrent thyroid cancer in reoperative neck surgery using ultrasound-guided methylene blue dye injection. J Am Coll Surg. 2012 Oct;215(4):555-61. doi: 10.1016/j.jamcollsurg.2012.06.006.
203. Zhang D, Wang T, Dionigi G, Fu Y, Zhang J, Zhao Y, Li J, Sun H. Application of Carbon Nanoparticles in Endoscopic Thyroidectomy via Bilateral Areola Approach: Total Thyroidectomy Plus Central Lymph Node Dissection. J Laparoendosc Adv Surg Tech A. 2019 Aug;29(8):1038-1041. doi: 10.1089/lap.2019.0102.
204. Shi C, Tian B, Li S, Shi T, Qin H, Liu S. Enhanced identification and functional protective role of carbon nanoparticles on parathyroid in thyroid cancer surgery: A retrospective Chinese population study. Medicine (Baltimore). 2016 Nov;95(46):e5148. doi: 10.1097/MD.000.000.0000005148.
205. Chen J, Zhou Q, Feng J, Wang J. Combined use of a nanocarbon suspension and 99mTc-MIBI for the intra-operative localization of the parathyroid glands. Am J Otolaryngol. 2018 Mar-Apr;39(2):138-141. doi: 10.1016/j.amjoto.2017.12.008.
206. Cox M.D., Stack Jr B.C. (2017). Minimally Invasive Radioguided Parathyroidectomy. In Stack, Jr. B.C., Bodenner D.L. (eds), Medical and Surgical Treatment of Parathyroid Diseases (pp.181-201). Little Rock, Springer.
207. You CJ, Zapas JL. Diminished dose minimally invasive radioguided parathyroidectomy: a case for radioguidance. Am Surg. 2007 Jul;73(7):669-72; discussion 673.
208. Formánek M, Dedek V, Koláček M, Havel M, Zeleník K, Komínek P. Individualised Timing of Radio-Guided Parathyroidectomy Using Multi-Phase SPECT/CT Increases In Vivo Sensitivity and Accuracy and Reduces Operating Time: A Randomised Clinical Trial. Diagnostics (Basel). 2021 Apr 9;11(4):677. doi: 10.3390/diagnostics11040677.
209. Pitt SC, Panneerselvan R, Sippel RS, Chen H. Radioguided parathyroidectomy for hyperparathyroidism in the reoperative neck. Surgery. 2009 Oct;146(4):592-8; discussion 598-9. doi: 10.1016/j.surg.2009.06.031.
210. Inabnet WB 3rd, Kim CK, Haber RS, Lopchinsky RA. Radioguidance is not necessary during parathyroidectomy. Arch Surg. 2002 Aug;137(8):967-70. doi: 10.1001/archsurg.137.8.967.
211. Burkey SH, Van Heerden JA, Farley DR, Thompson GB, Grant CS, Curlee KJ. Will directed parathyroidectomy utilizing the gamma probe or intraoperative parathyroid hormone assay replace bilateral cervical exploration as the preferred operation for primary hyperparathyroidism? World J Surg. 2002 Aug;26(8):914-20. doi: 10.1007/s00268.002.6618-8.
212. 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 Dec;126(6):1023-8; discussion 1028-9. doi: 10.1067/msy.2099.101578.
213. Desiato V, Melis M, Amato B, Bianco T, Rocca A, Amato M, Quarto G, Benassai G. Minimally invasive radioguided parathyroid surgery: A literature review. Int J Surg. 2016 Apr;28 Suppl 1:S84-93. doi: 10.1016/j.ijsu.2015.12.037.
214. McGreal G, Winter DC, Sookhai S, Evoy D, Ryan M, O'Sullivan GC, Redmond HP. Minimally invasive, radioguided surgery for primary hyperparathyroidism. Ann Surg Oncol. 2001 Dec;8(10):856-60. doi: 10.1007/s10434.001.0856-0.
215. Chen H, Mack E, Starling JR. Radioguided parathyroidectomy is equally effective for both adenomatous and hyperplastic glands. Ann Surg. 2003 Sep;238(3):332-7; discussion 337-8. doi: 10.1097/01.sla.000.008.6546.68794.9a.
216. Friedman M, Gurpinar B, Schalch P, Joseph NJ. Guidelines for radioguided parathyroid surgery. Arch Otolaryngol Head Neck Surg. 2007 Dec;133(12):1235-9. doi: 10.1001/archotol.133.12.1235.
217. Jaskowiak NT, Sugg SL, Helke J, Koka MR, Kaplan EL. Pitfalls of intraoperative quick parathyroid hormone monitoring and gamma probe localization in surgery for primary hyperparathyroidism. Arch Surg. 2002 Jun;137(6):659-68; discussion 668-9. doi: 10.1001/archsurg.137.6.659.
218. Ilgan S, Ozbas S, Bilezikci B, Sengezer T, Aydin OU, Gursoy A, Kocak S. Radioguided occult lesion localization for minimally invasive parathyroidectomy: technical consideration and feasibility. Nucl Med Commun. 2014 Nov;35(11):1167-74. doi: 10.1097/MNM.000.000.0000000188.
219. Dalcı K, Topal U, Ünal AG, Eray İC, Yalav O, Güney İB, Sakman G. Is radioguided occult lesion localization (ROLL) an effective and reliable method in thyroid cancer and parathyroid redo surgery? Ann Ital Chir. 2019 Nov 19;8:S0003469X19031464. Epub ahead of print.
220. Saylam G. (2021). Paratiroid bezi ve hastalıkları. In Korkmaz M.H., Önerci M. (Eds), Kulak Burun Boğaz ve Baş Boyun Cerrahisi – Baş Boyun Cerrahisi (2nd ed, pp.239-248). Ankara, Güneş Kitapevleri.
221. Ilgan S, Oztürk E, Yildiz R, Emer O, Ayan A, Görgülü S, Alagöz E, Deveci S, Ozgüven MA, Tufan T. Combination of preoperative

ultrasonographic mapping and radioguided occult lesion localization in patients with locally recurrent/persistent papillary thyroid carcinoma: a practical method for central compartment reoperations. Clin Nucl Med. 2010 Nov;35(11):847-52. doi: 10.1097/RLU.0b013e3181f48403.

222. Urkan M, Peker YS, Ozturk E. Minimally invasive parathyroidectomy for primary hyperparathyroidism. Acta Endocrinol (Buchar). 2019 Apr-Jun;15(2):182-186. doi: 10.4183/aeb.2019.182.