Acta Med. Okayama, 2026
Vol. 80, No. 4, pp. 241–246

Acta Medica Okayama
http://escholarship.lib.okayama-u.ac.jp/amo/

Case Report

Video-Assisted Thoracoscopic Resection of an Upper Mediastinal Ectopic Parathyroid Adenoma

Yuta Hasegawa[a], Hironori Tsujimoto[a]*, Naoyuki Uehata[a], Risa Kariya[a], Asuma Ide[a], Takafumi Suzuki[a], Seiichiro Fujishima[a], Keita Kouzu[a], Yoshihisa Yaguchi[a], Kosuke Miyai[b], Ayumu Kurihara[b], Sho Ogata[b], Susumu Matsukuma[b], and Hideki Ueno[a]

Departments of [a]Surgery, [b]Laboratory Medicine, National Defense Medical College Hospital, Tokorozawa, Saitama 359-8513, Japan

Primary hyperparathyroidism (pHPT) is typically caused by a parathyroid adenoma, although some cases arise from ectopic glands. Accurate preoperative localization is essential for guiding surgical strategy, particularly for mediastinal lesions. We report successful video-assisted thoracoscopic surgery (VATS) for an upper mediastinal parathyroid adenoma. A 68-year-old woman was referred for hypercalcemia during evaluation for recurrent ureteral stones. Laboratory tests revealed elevated serum calcium (13.2 mg/dl) and intact parathyroid hormone (iPTH) levels (266 pg/ml). Contrast-enhanced computed tomography, magnetic resonance imaging, and 99mTc-methoxyisobutylisonitrile scintigraphy identified a 20-mm mass adjacent to the right esophageal wall. VATS was performed due to the tumor's mediastinal location. The lesion was resected with intraoperative nerve monitoring (IONM) to avoid recurrent laryngeal nerve damage. Postoperatively, iPTH and calcium levels rapidly normalized. Transient hypocalcemia and mild hoarseness occurred but resolved with calcium supplementation and conservative management. Pathological examination confirmed a parathyroid adenoma without malignancy. VATS offers a safe and minimally invasive approach for upper mediastinal parathyroid adenomas. IONM and vigilant calcium management are crucial for minimizing these complications. This case highlights the importance of comprehensive imaging, surgical planning, and postoperative care in managing upper mediastinal pHPT.

Key words: primary hyperparathyroidism, parathyroid neoplasm, ectopic tissue, video-assisted thoracoscopic surgery

Primary hyperparathyroidism (pHPT) is characterized by excessive secretion of parathyroid hormone (PTH), leading to hypercalcemia and complications like urolithiasis and bone metabolism disorders [1]. Approximately 80-85% of pHPT cases are caused by a single parathyroid adenoma, whereas 15-20% arise from ectopic glands [2-4]. Ectopic parathyroid glands result from aberrant migration of inferior parathyroid glands originating from the third pharyngeal pouch and descending along with the thymus. Ectopic glands are found in the neck (11.6%) and mediastinum (4.3%), the retro/paraoesophageal space being the most common cervical site (31.4%) [5].

Complete surgical resection is the most effective treatment for parathyroid tumors, requiring precise preoperative tumor localization. Cervical ultrasonography often fails to detect mediastinal lesions; therefore, additional imaging modalities such as 99mTc-methoxyisobutylisonitrile (MIBI) scintigraphy or single-

Received December 29, 2025; accepted April 6, 2026.
*Corresponding author. Phone: +81-4-2995-1637
E-mail: tsujihi@ndmc.ac.jp (H. Tsujimoto)

Conflict of Interest Disclosures: No potential conflict of interest relevant to this article was reported.

photon emission computed tomography/computed tomography (SPECT/CT), magnetic resonance imaging (MRI), and contrast-enhanced CT (CE-CT) are recommended for accurate localization [4]. For upper mediastinal tumors, the appropriate surgical approach (cervical or thoracic) must be selected based on tumor location.

We report a case of successful video-assisted thoracoscopic surgery (VATS) for an upper mediastinal parathyroid tumor, with favorable postoperative outcomes confirmed by frequent hormone monitoring.

Case Presentation

A 68-year-old woman presented with hypercalcemia, identified during treatment for recurrent ureteral stones. Laboratory testing revealed elevated intact parathyroid hormone (iPTH; 266 pg/ml; reference range 15-65 pg/ml), serum calcium (13.2 mg/dl; reference range 8.8-10.1 mg/dl), and ionized calcium (7.01 mg/dl; reference range 4.61-5.17 mg/dl). While cervical ultrasonography was negative, CE-CT, MRI, and 99mTc-MIBI scintigraphy revealed a 20-mm mass adjacent to the right esophagus (Fig. 1). The patient requested surgery due to recurrent ureteral stones. Given the tumor's location in the right upper mediastinum, adjacent to the esophagus and the right recurrent laryngeal nerve, and its depth (approximately 5 cm from the clavicle's upper edge), a thoracoscopic approach was selected over a transcervical one to ensure safe and complete resection.

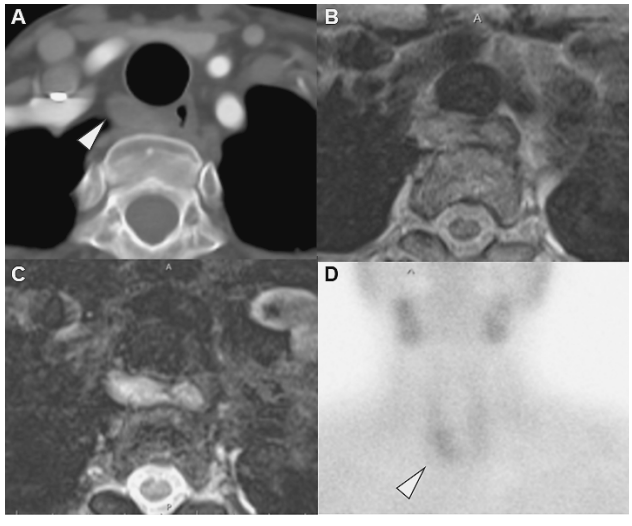

Fig. 1 Preoperative images. **A**, Computed tomography (CT). A 20 × 10-mm mass is identified in the upper mediastinum, adjacent to the right esophageal wall (arrowhead); **B**, Magnetic resonance imaging (MRI) (T1-weighted image). B, Image reveals a cystic tumor with a high-intensity septum and a homogeneous low-intensity internal component; **C**, MRI (T2-weighted image). Image reveals a high-intensity septum and high-intensity tumor with internal heterogeneity; **D**, 99mTc-methoxyisobutylisonitrile scintigraphy. Radiotracer uptake is observed in the right upper mediastinum (arrowhead).

Operative procedure. After induction of general anesthesia with single-lumen endotracheal intubation for intraoperative nerve monitoring (IONM), the patient was placed in the semi-prone position. Two 12-mm working ports were placed at the fifth and seventh intercostal spaces along the posterior axillary line, and a camera port was positioned at the ninth intercostal space along the scapular line. Carbon dioxide was insufflated (6 mmHg) to create an artificial pneumothorax. The surgical approach resembled lymph node dissection along the right recurrent laryngeal nerve in esophageal cancer. The visceral pleura was incised along the vagus nerve, and the right subclavian artery and right recurrent nerve were identified. The reddish-brown tumor was located between the right esophageal wall and the right recurrent laryngeal nerve (Fig. 2). Mild adhesions connected the tumor capsule, right recurrent nerve, and esophageal wall. IONM guided sharp dissection of the capsule with scissors, ensuring separation without injury to the capsule or nerves. The tumor was placed in a specimen retrieval bag and removed from the thoracic cavity. Operative time was 124 min, with approximately 5 ml blood loss.

Postoperative course. iPTH levels normalized to 20 pg/ml 1 h postoperatively and remained stable. Serum calcium and ionized calcium (iCa) levels initially normalized within 24 h postoperatively (Fig. 3). However, intravenous administration of 20 ml of 8.5% calcium gluconate twice daily was initiated on the first postoperative day. On the second postoperative day, however, serum calcium levels remained low at 8.7 mg/dl, and iCa levels were 4.82 mg/dl. Intravenous administration of 40 ml of 8.5% calcium gluconate per day was initiated on the first postoperative day, and oral supplementation with 3 g/day of calcium lactate was initiated on the third postoperative day. By postoperative days 3-5, serum Ca and iCa levels stabilized within the normal range at 9.1-9.5 mg/dl and 4.76-5.02 mg/dl, respectively. Calcium gluconate administration was

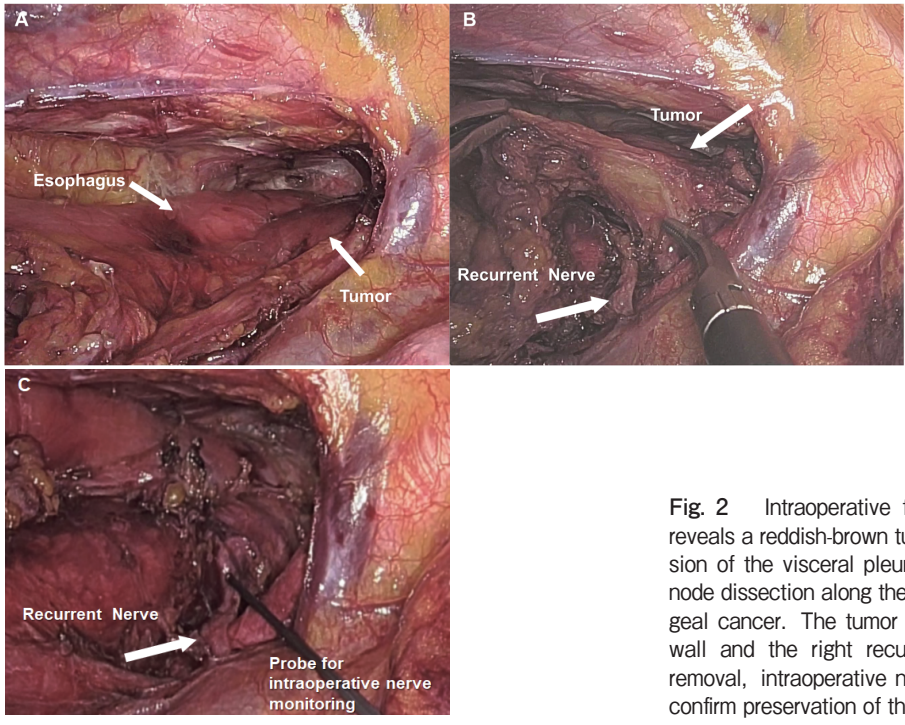

Fig. 2 Intraoperative findings. **A**, Thoracoscopic observation reveals a reddish-brown tumor adjacent to the esophagus after incision of the visceral pleura. ; **B**, The procedure resembles lymph node dissection along the right recurrent laryngeal nerve in esophageal cancer. The tumor is located between the right esophageal wall and the right recurrent laryngeal nerve. ; **C**, After tumor removal, intraoperative neuromonitoring (IONM) was performed to confirm preservation of the right recurrent laryngeal nerve.

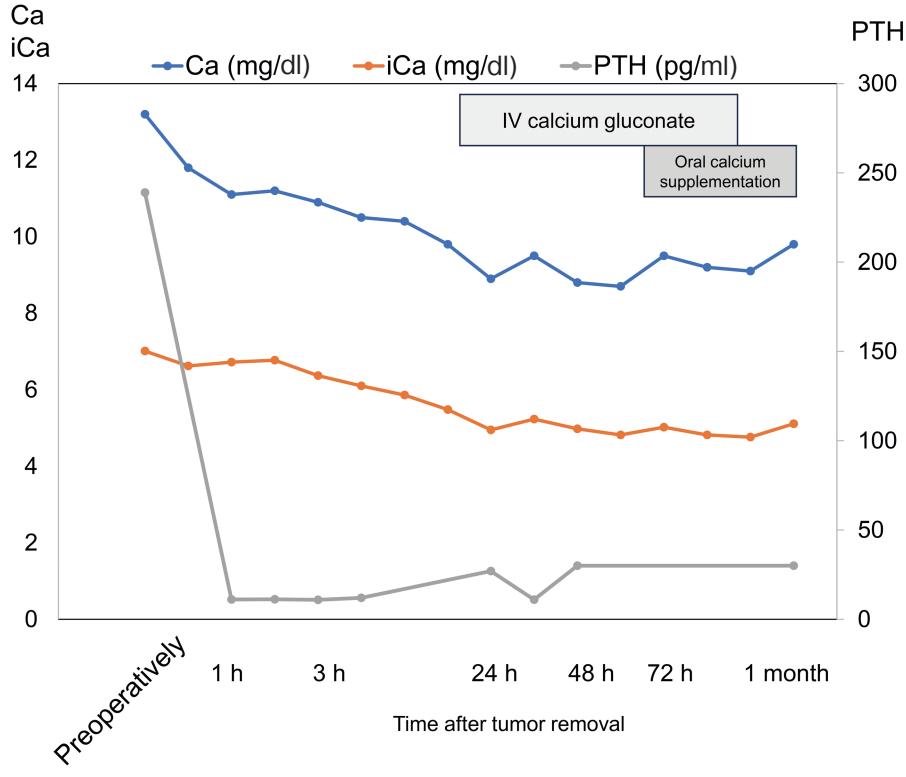

Fig. 3 Postoperative changes in parathyroid hormone, calcium, and ionized calcium levels. PTH, parathyroid hormone; Ca, calcium; iCa, ionized calcium; IV, intravenous.

discontinued, and the patient was discharged on oral calcium supplementation, with subsequent outpatient follow-up. The postoperative course was uneventful apart from slight hoarseness unconfirmed by laryngoscopic examination. The patient was discharged on postoperative day 6. One month post-surgery, both serum iPTH and calcium levels remained within the reference range, and the patient's hoarseness resolved.

The tumor was diagnosed as a parathyroid adenoma originating from an ectopic upper mediastinal parathyroid gland. The tumor size was $37 \times 16 \times 9$ mm. No tumor cells were present at the resection margin, and no features of malignancy were identified (Fig. 4).

Discussion

Here, we report a case of pHPT successfully treated by resection of a rare upper mediastinal ectopic parathyroid adenoma using VATS. Mediastinal ectopic parathyroid adenomas are rare; only 2% of all parathyroidectomies require thoracic approaches [6].

Surgical resection of ectopic parathyroid glands from the upper mediastinum has been reported using both cervical and thoracic approaches. The cervical approach is less invasive and preferred when lesions are cervically accessible [4]. Callender *et al.* [7] reported a significant decrease in cervical approach success rates when the lesion's center was >6 cm from the superior clavicular border, highlighting the importance of anatomical localization for surgical planning. Conversely, for distances <6 cm, cervical minimally invasive parathyroidectomy remains a viable option. VATS, a thoracic approach, is minimally invasive and offers excellent visualization [7]. Said *et al.* [9] demonstrated significantly reduced hospital stays with VATS compared to conventional thoracotomy (2 vs. 6 days), and Khan *et al.* [10] similarly reported a median hospital stay of 2 days following thoracoscopic resection. These findings suggest that VATS is a useful, minimally invasive option for appropriately selected cases of mediastinal ectopic parathyroid adenomas, supporting its use as a first-line option for these adenomas [8]. Accordingly, we selected VATS for this case, based on the tumor's anatomical location.

Localization of ectopic parathyroid tumors often requires multimodal imaging. 99mTc-MIBI scintigraphy effectively provides functional imaging of parathyroid lesions; however, Zhang *et al.* [12,13] reported limited sensitivity, recommending combination with SPECT/CT for improved anatomical detail. MRI, with

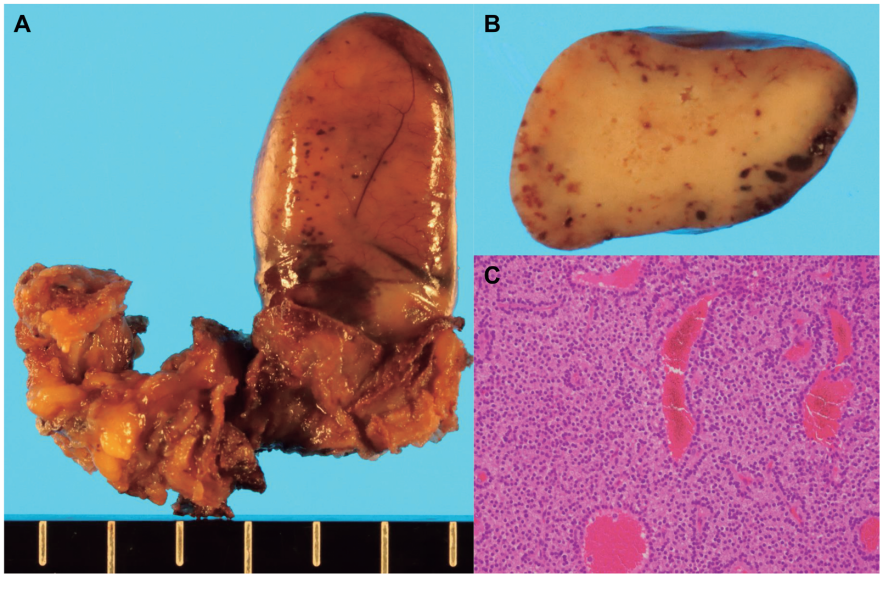

Fig. 4 Macroscopic and microscopic findings of the resected specimen. **A**, Macroscopically, the tumor is reddish-brown, encapsulated, and measures $37 \times 16 \times 9$ mm.; **B**, On the cut surface, the tumor appears as a yellow solid mass with punctate hemorrhage.; **C**, Histological examination revealed sheet-like proliferation of tumor cells with round nuclei and eosinophilic, granular, cuboidal to polygonal cytoplasm, consistent with parathyroid adenoma. Neither nuclear atypia, mitotic figures, nor capsular invasion was observed. No findings suggestive of malignancy were observed. (Hematoxylin–eosin staining).

its high soft-tissue resolution, is particularly useful for detecting mediastinal lesions. Morris *et al.* emphasized the importance of combining MIBI-SPECT/CT with MRI for accurate diagnosis. In the present case, concordant 99mTc-MIBI scintigraphy and MRI findings supported a reliable preoperative diagnosis, facilitating strategic surgical planning. Rubello *et al.* [14] demonstrated that intraoperative radio-guided localization using a gamma probe is useful for identifying ectopic parathyroid tissue. It involves intraoperative injection of a radiotracer and real-time detection with a gamma probe. Although radiation exposure to both patients and medical staff requires caution, this technique proves valuable in selected cases with multiple suspected lesions or when direct visualization is challenging.

In the present case, iPTH levels normalized within 1 h of tumor removal. Normalized iPTH levels confirm complete resection, making intra-or postoperative iPTH measurement essential during ectopic parathyroid tumor resection. Akgun *et al.* [15] reported that intraoperative monitoring of iPTH levels at 10 and 20 min post-resection could improve the surgical cure rate. As real-time iPTH measurements were unavailable at our hospital, we pooled postoperative serum samples for later analysis.

VATS-based resection of ectopic parathyroid tumors is relatively straightforward for surgeons experienced in esophageal cancer procedures. In the present case, the approach closely resembled lymph node dissection along the right recurrent laryngeal nerve. IONM was helpful for nerve preservation, as in esophagectomy. As noted by Randolph *et al.* [16], international guidelines consider IONM a standard adjunct in thyroid and parathyroid surgery and useful for nerve identification and immediate recognition of intraoperative injury. While IONM enables real-time recognition of nerve injury and guides postoperative management, it does not prevent the injury itself, reflecting its utility and limitations.

In the present case, transient postoperative hypocalcemia was observed but promptly corrected with intravenous and oral calcium supplementation, effectively preventing hungry bone syndrome (HBS). In pHPT, prolonged elevation of PTH levels drives bone resorption. After surgical resection, the sudden decrease in PTH levels can lead to rapid bone calcium uptake, increasing the risk of hypocalcemia and HBS [9]. Kaya *et al.* [18] reported transient hypocalcemia in 38.4% of patients and HBS in 13.4% after pHPT surgery. Elevated preoperative PTH and alkaline phosphatase levels, along with a history of bone disease, have been identified as HBS risk factors. Early PTH measurement and continuous calcium monitoring are essential for HBS prevention and optimal postoperative outcomes [10]. For patients with persistent hypercalcemia, as in the present case, close monitoring and timely intervention are key to avoiding complications and achieving favorable outcomes.

Conclusion

An upper mediastinal parathyroid adenoma was successfully resected via VATS following accurate preoperative localization. Despite transient recurrent laryngeal nerve palsy and hypocalcemia, appropriate intraoperative precautions and postoperative calcium supplementation prevented serious complications. This case suggests that VATS is a useful and safe surgical option for superior mediastinal ectopic parathyroid adenomas, with careful patient selection based on anatomical and imaging findings, and highlights effective diagnostic, surgical, and postoperative management strategies.

Acknowledgments. We thank Editage (www.editage.jp) for English language editing.

References

1. Yeh MW, Ituarte PH, Zhou HC, Nishimoto S, Liu IL, Harari A, Haigh PI and Adams AL: Incidence and prevalence of primary hyperparathyroidism in a racially mixed population. J Clin Endocrinol Metab (2013) 98: 1122–1129.
2. Gawrychowski J, Kowalski GJ, Bula G, Bednarczyk A, Zadlo D, Niedzielski Z, Gawrychowska A and Koziolek H: Surgical Management of Primary Hyperparathyroidism-Clinicopathologic Study of 1019 Cases from a Single Institution. J Clin Med (2020) 9.
3. Peissig K, Condie BG and Manley NR: Embryology of the Parathyroid Glands. Endocrinol Metab Clin North Am (2018) 47: 733–742.
4. Wilhelm SM, Wang TS, Ruan DT, Lee JA, Asa SL, Duh QY, Doherty GM, Herrera MF, Pasieka JL, Perrier ND, Silverberg SJ, Solorzano CC, Sturgeon C, Tublin ME, Udelsman R and Carty SE: The American Association of Endocrine Surgeons Guidelines for Definitive Management of Primary Hyperparathyroidism. JAMA Surg (2016) 151: 959–968.
5. Taterra D, Wong LM, Vikse J, Sanna B, Pekala P, Walocha J, Cirocchi R, Tomaszewski K and Henry BM: The prevalence and anatomy of parathyroid glands: a meta-analysis with implications for parathyroid surgery. Langenbecks Arch Surg (2019) 404: 63–

70.
6. Yutaka Y, Omasa M, Shikuma K and Taki T: Video-assisted mediastinoscopic resection of ectopic parathyroid adenoma. Asian Cardiovasc Thorac Ann (2012) 20: 731–733.
7. Callender GG, Grubbs EG, Vu T, Hofstetter WL, Fleming JB, Woodburn KL, Lee JE, Evans DB and Perrier ND: The fallen one: the inferior parathyroid gland that descends into the mediastinum. J Am Coll Surg (2009) 208: 887–893; discussion 893–885.
8. Karla Veronica C, Mariana CT, Adriana Graciela PR, Gabino CP and Francina Valezka BM: Thoracoscopic treatment of mediastinal ectopic parathyroid adenomas: a Latinamerica experience case series and literature review. J Cardiothorac Surg (2024) 19: 177.
9. Said SM, Cassivi SD, Allen MS, Deschamps C, Nichols FC, 3rd, Shen KR and Wigle DA: Minimally invasive resection for mediastinal ectopic parathyroid glands. Ann Thorac Surg (2013) 96: 1229–1233.
10. Amer K, Khan AZ, Rew D, Lagattolla N and Singh N: Video assisted thoracoscopic excision of mediastinal ectopic parathyroid adenomas: a UK regional experience. Ann Cardiothorac Surg (2015) 4: 527–534.
11. Titu IM, Silaghi CA, Ciulic SA, Teterea F, Mlesnite M and Palade E: Progress in the Management of Mediastinal Ectopic Parathyroid Adenomas: The Role of Minimally Invasive Surgery. J Clin Med (2025) 14.
12. Zhang R, Zhang Z, Huang P, Li Z, Hu R, Zhang J, Qiu W and Hu P: Diagnostic performance of ultrasonography, dual-phase (99m)Tc-MIBI scintigraphy, early and delayed (99m)Tc-MIBI SPECT/CT in preoperative parathyroid gland localization in secondary hyperparathyroidism. BMC Med Imaging (2020) 20: 91.
13. Morris MA, Saboury B, Ahlman M, Malayeri AA, Jones EC, Chen CC and Millo C: Parathyroid Imaging: Past, Present, and Future. Front Endocrinol (Lausanne) (2021) 12: 760419.
14. Rubello D, Piotto A, Casara D, Muzzio PC, Shapiro B and Pelizzo MR: Role of gamma probes in performing minimally invasive parathyroidectomy in patients with primary hyperparathyroidism: optimization of preoperative and intraoperative procedures. Eur J Endocrinol (2003) 149: 7–15.
15. Akgun IE, Unlu MT, Aygun N, Kostek M and Uludag M: Contribution of intraoperative parathyroid hormone monitoring to the surgical success in minimal invasive parathyroidectomy. Front Surg (2022) 9: 1024350.
16. Randolph GW, Dralle H, International Intraoperative Monitoring Study G, Abdullah H, Barczynski M, Bellantone R, Brauckhoff M, Carnaille B, Cherenko S, Chiang FY, Dionigi G, Finck C, Hartl D, Kamani D, Lorenz K, Miccolli P, Mihai R, Miyauchi A, Orloff L, Perrier N, Poveda MD, Romanchishen A, Serpell J, Sitges-Serra A, Sloan T, Van Slycke S, Snyder S, Takami H, Volpi E and Woodson G: Electrophysiologic recurrent laryngeal nerve monitoring during thyroid and parathyroid surgery: international standards guideline statement. Laryngoscope (2011) 121 Suppl 1: S1–16.
17. Witteveen JE, van Thiel S, Romijn JA and 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) 168: R45–53.
18. Kaya C, Tam AA, Dirikoc A, Kilicyazgan A, Kilic M, Turkolmez S, Ersoy R and Cakir B: Hypocalcemia development in patients operated for primary hyperparathyroidism: Can it be predicted preoperatively? Arch Endocrinol Metab (2016) 60: 465–471.
19. Barraud S, Lopez AG, Sokol E, Menegaux F and Briet C: Chapter 14: Post surgical follow-up of primary hyperparathyroidism. Ann Endocrinol (Paris) (2025) 86: 101703.