Understanding the parathyroid glands: Function and importance in calcium regulation.

Dana M*

Department of Surgery, NorthShore University, USA

Introduction

The human endocrine system is a marvel of intricate coordination, relying on a network of glands that release hormones to regulate various physiological processes. Among these critical components are the parathyroid glands, small but immensely significant structures located in the neck. Despite their modest size, these glands play a pivotal role in maintaining calcium balance in the body, a function that impacts numerous aspects of health, from bone strength to muscle function. The parathyroid glands, typically numbering four, are positioned on the posterior side of the thyroid gland. Each gland is roughly the size of a grain of rice, yet their influence extends far beyond their physical dimensions. The primary function of these glands is the secretion of Parathyroid Hormone (PTH), a key regulator of calcium levels in the blood. PTH is essential for maintaining calcium homeostasis, a balance that is crucial for several physiological processes [1, 2].

Calcium is a vital mineral involved in many bodily functions. It is a major component of bone tissue, contributing to bone density and strength. Adequate calcium levels are necessary to prevent bone disorders such as osteoporosis and to support overall skeletal health. Additionally, calcium is crucial for muscle function. Muscle contraction, including the contraction of the heart muscle, relies on the availability of calcium ions. Without proper calcium levels, muscle function can be compromised, potentially leading to weakness or spasms. Calcium also plays a critical role in nerve transmission. Neurons rely on calcium ions to release neurotransmitters and transmit nerve impulses. This process is fundamental for normal nerve function and communication throughout the body. Furthermore, calcium is involved in blood clotting, acting as a cofactor for various clotting factors necessary for effective blood coagulation [3, 4].

To maintain stable blood calcium levels, the parathyroid glands regulate several mechanisms. When calcium levels in the blood drop, PTH is released to address the deficiency. One of the primary actions of PTH is to stimulate osteoclasts, the cells responsible for bone resorption. Osteoclasts break down bone tissue, releasing calcium into the bloodstream and thus increasing blood calcium levels. This process is part of the body's response to low calcium levels, helping to restore balance. PTH also affects kidney function. In the kidneys, PTH enhances calcium reabsorption, reducing the amount of calcium lost in urine. Additionally, PTH promotes the conversion of vitamin D into its active form, calcitriol. Calcitriol plays a crucial role in increasing calcium absorption from the gut, thereby contributing to higher blood calcium levels. This indirect effect of PTH on intestinal calcium absorption underscores the interconnected nature of hormonal regulation [5, 6].

Phosphorus regulation is another aspect influenced by PTH. The hormone decreases the reabsorption of phosphate in the kidneys, leading to increased phosphate excretion in the urine. This action helps maintain a balanced calcium-to-phosphorus ratio in the blood, which is important for overall mineral homeostasis. Disorders of the parathyroid glands can lead to significant health issues, primarily affecting calcium regulation. Hyperparathyroidism, characterized by excessive production of PTH, can be classified into primary, secondary, and tertiary forms. Primary hyperparathyroidism is often caused by a benign tumor (adenoma) in one of the parathyroid glands, leading to elevated blood calcium levels (hypercalcemia). Symptoms of hypercalcemia can include bone pain, kidney stones, and gastrointestinal problems [7, 8].

Secondary hyperparathyroidism arises as a compensatory response to low calcium levels, commonly due to chronic kidney disease or vitamin D deficiency. In this condition, the parathyroid glands become overactive in an attempt to increase blood calcium levels. Tertiary hyperparathyroidism occurs when prolonged secondary hyperparathyroidism leads to autonomous overproduction of PTH, even after the initial cause is addressed. Hypoparathyroidism is another condition where the parathyroid glands do not produce enough PTH, resulting in low blood calcium levels (hypocalcemia). This deficiency can lead to symptoms such as muscle cramps, tingling sensations, and in severe cases, seizures. Causes of hypoparathyroidism include autoimmune disorders, surgical removal of the parathyroid glands, or genetic conditions affecting gland function [9, 10].

Conclusion

In summary, the parathyroid glands, though small, are integral to the body's ability to regulate calcium and phosphorus levels. Through the secretion of PTH, these glands influence bone health, muscle function, nerve transmission, and blood clotting. Disorders of the parathyroid glands can lead to significant health issues, making understanding their function

***Correspondence to:** Dana M, Department of Surgery, NorthShore University, USA. E-mail: danam87@nsh.org

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and maintaining their health crucial for overall well-being. The intricate balance maintained by the endocrine system underscores the importance of each component in sustaining optimal health and functionality.

References

1. Guilmette J, Sadow PM. Parathyroid pathology. Surg Pathol Clin. 2019;12(4):1007-19.
2. Petranović Ovčariček P, Giovanella L, Carrió Gasset I, et al. The EANM practice guidelines for parathyroid imaging. Eur J Nucl Med Mol Imaging. 2021;48:2801-22.
3. Peissig K, Condie BG, Manley NR. Embryology of the parathyroid glands. Endocrinol Metab Clin North Am. 2018;47(4):733-42.
4. Tjahjono R, Nguyen K, Phung D, et al. Methods of identification of parathyroid glands in thyroid surgery: a literature review. ANZ J Surg. 2021;91(9):1711-6.
5. Giovanella L, Hindie E, Huellner MW, et al. An essential practice summary of the new EANM guidelines for parathyroid imaging. Q J Nucl Med Mol Imaging. 2022;66(2):93-103.
6. Van Slycke S, Van Den Heede K, Brusselaers N, et al. Feasibility of autofluorescence for parathyroid glands during thyroid surgery and the risk of hypocalcemia: first results in Belgium and review of the literature. Surg Innov. 2021;28(4):409-18.
7. Baloch ZW, LiVolsi VA. Pathology of the parathyroid glands in hyperparathyroidism. Semin Diagn Pathol. 2013;30(3):165-177.
8. Lalonde MN, Correia RD, Sykiotis GP, et al. Parathyroid imaging. Semin Nucl Med. 2023;53(4): 490-502.
9. Yuan Y, Li X, Bao X, et al. The magic mirror: a novel intraoperative monitoring method for parathyroid glands. Front Endocrinol. 2023;14:1160902.
10. Verdelli C, Vaira V, Corbetta S. Parathyroid tumor microenvironment. Adv Exp Med Biol. 2020:37-50.

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