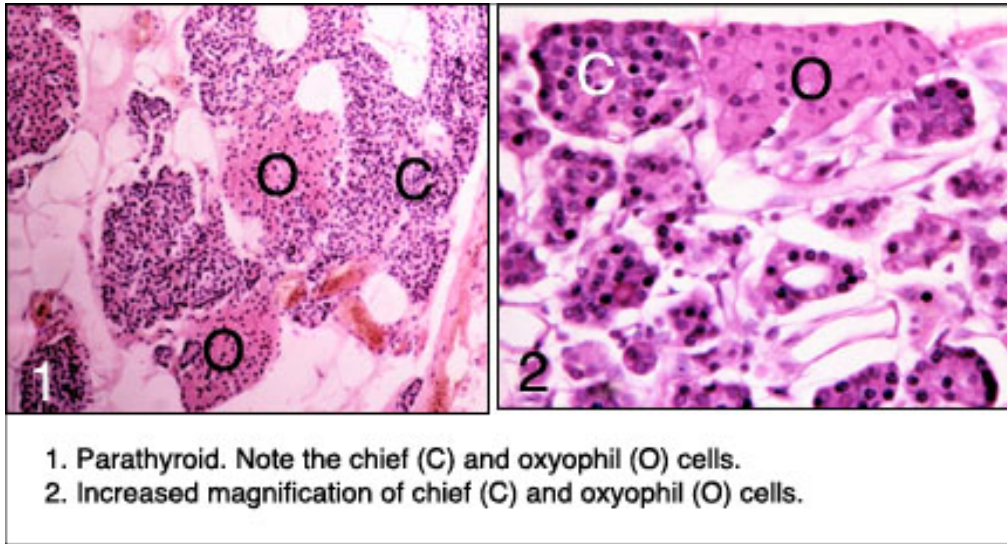


Parathyroid



The parathyroid glands are small, brownish, oval bodies 4 to 8 mm long and 2 to 5 mm wide. There usually are four in humans, but as many as six or more may lie within the capsule of the thyroid gland or may be embedded in the substance of the middle third of the thyroid. In about 8% of the human population, additional parathyroid tissue is present in the thymus, the association being due to the common developmental origin of these structures from the third pharyngeal pouch. Each parathyroid weighs about 130 mg; those in women are slightly heavier than in men.

Each parathyroid gland is surrounded by a thin connective tissue capsule and is subdivided by delicate trabeculae that extend from the capsule. Blood vessels, lymphatics, and nerves course through the trabeculae to enter the substance of the parathyroid. In older individuals fat cells often are abundant and may form about 50% of the gland. The parenchyma consists of closely packed groups or cords of epithelial cells supported by a delicate framework of reticular fibers that contains nerve fibers and a rich capillary network.

The parenchyma contains two types of cells. *Chief (principal) cells* are the more numerous and measure 8 to 10 μm in diameter. They have round, centrally placed, vesicular nuclei, and the cytoplasm contains the usual organelles as well as large accumulations of glycogen and lipid droplets. In addition to small, dense, membrane-bound granules, lipofuscin granules often are present also. *Oxyphil cells* form only a small part of the cell population and may occur singly or in small groups. They are not present in significant numbers until puberty and then increase with age. Oxyphil cells are larger than chief cells, and their cytoplasm stains intensely with eosin and is packed with large, elongated mitochondria that show numerous cristae. Between mitochondria are small accumulations of glycogen and occasional profiles of granular endoplasmic reticulum. The small nuclei stain deeply and often appear pyknotic.

Numerous cells that are intermediate in appearance between chief and oxyphil cells also have been described. Chief cells are the primary parenchymal element of the parathyroid gland, and other cell types (such as the oxyphil and intermediate cells) may represent a modification or a stage of development of the chief cell.

The parathyroid secretes parathyroid hormone (PTH), a polypeptide hormone that regulates the calcium level of the blood. Nearly half the blood calcium is bound to albumin; the remainder is present as free ions. It is the concentration of free calcium ion that governs the secretion of parathyroid hormone. If the concentration of ionized calcium drops below normal (8.6-10.6 mg/dl), parathyroid hormone is secreted and acts directly on osteoclasts and osteocytes to mobilize calcium ion from bone and on the renal tubules to promote absorption of calcium ion and inhibit absorption of phosphate ion from the glomerular filtrate. Parathyroid hormone acts on the proximal tubule within the kidney to inhibit phosphate reabsorption (about 95% of phosphate is normally reabsorbed at this location) and on the thick ascending limb of the loop of Henle and distal tubule to increase the reabsorption of calcium ion. Parathyroid hormone also acts on vitamin D metabolism. Vitamin D is a sterol produced by the skin or absorbed in the diet. Parathyroid hormone acts on the renal proximal convoluted tubule to promote the conversion of 25(OH)-vitamin D to the active form, 1, 25-(OH)₂-vitamin D. This active form of vitamin D increases calcium absorption in the small intestine. Increase in the concentration of calcium ion in the blood results in a decrease in the amount of PTH released. Blood levels of calcium are kept from exceeding the optimum by a second calcium-regulating hormone, calcitonin, produced by the parafollicular cells of the thyroid gland. Parathyroid hormone is essential for life. Complete removal of the parathyroid glands results in a precipitous drop in blood calcium followed by tetany and death.

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