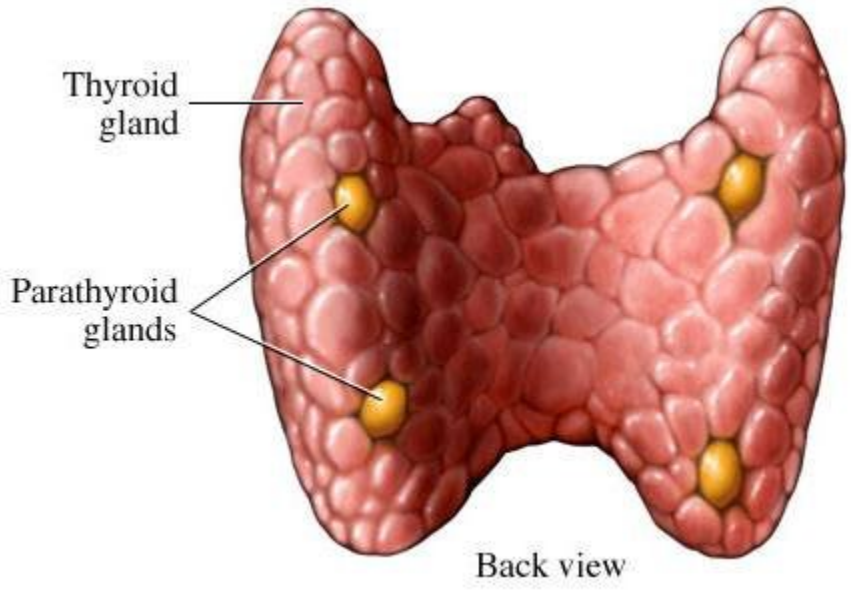
Parathyroid Gland

The parathyroid gland is a type of endocrine gland that occurs in the upper and lower poles of the thyroid gland.

- There are four parathyroid glands that are distributed as two glands on either side of the thorax.
- The number of parathyroid glands in humans can differ between different individuals. As many as eight parathyroid glands have been reported, some of which might be located in other areas in the neck.
- The parathyroid gland releases the parathyroid hormone, also called parathormone that is responsible for regulating the calcium balance in the blood.
- The parathyroid gland is directly involved in the workings of different organs in the body like the kidneys, bones, and small intestine.
- The regulation of calcium level in the blood is maintained by influencing the absorption of calcium from the food or via osteoporosis to increase the blood calcium level.

Structure of Parathyroid Gland



- Parathyroid glands occur as nodular structures derived from the endodermal tissues that are present on the dorsal side of the thyroid gland.
- The size of the glands differs in different people, but the average weight of each of the glands is about 50 grams.
- Each of the glands is surrounded by capsules composed of fine connective tissues that enclose spherical cells arranged in columns with sinusoids containing blood.
- The parathyroid glands consist of two different types of cells; chief cells and oxyphil cells.
- The chief cells are the functional cells of the parathyroid gland that perform the function of both synthesis and secretion of the parathyroid hormone.
- The regulation of hormone synthesis and release depends on the calcium levels in the serum.
- The surface of the chief cells contains G protein-coupled transmembrane receptors called calcium-sensing receptors (CaSR) that respond to low blood calcium levels.

- The oxyphil cells, also called oxyntic cells, are also found in the parathyroid gland, but these do not have any endocrine function. The number of oxyphil cells in the parathyroid gland increases with age.

Hormones of Parathyroid Gland

- The parathyroid gland produces the parathyroid hormone, or parathormone, as the single most important hormone that controls the calcium level in the blood.
- The control of Ca2+ level in the blood is essential as Ca2+ homeostasis is involved in nerve impulse transmission, muscle contraction as well as blood clotting.
- The decrease in the level of blood calcium is recognized by the receptors on the chief cells, which then stimulate the cell to release the parathormone.
- The release of parathormone causes cells of the skeleton system, the digestive system as well as the kidney to employ a different mechanism to retain calcium in the blood.
- In the bones, the process of osteoporosis takes place, which causes the osteoclasts to break down calcium of the bone so that the level of calcium in the blood can be maintained.
- In the kidneys, the hormone stimulates the retention of calcium during filtration while activating vitamin D.
- The activated Vitamin D is important in the reabsorption of calcium in the distal tubule of the nephrons as it is controlled by a cytosolic vitamin D-dependent calcium-binding protein.

Functions of Parathyroid Gland

The following are some of the functions of the parathyroid gland;

1. The most important function of the parathyroid gland is the synthesis and release of parathyroid hormone that is essential to maintain calcium homeostasis in the body.
2. The release of parathormone from the gland inhibits osteoblastic activity and stimulates osteoclastic activity, which causes calcium breakdown and releases into the bloodstream.
3. The parathormone also affects the nephrons of the kidney, where it induces reabsorption of calcium by regulating the calcium transporter.
4. In the gastrointestinal tract, the parathyroid gland doesn't have a direct effect, but it increases vitamin D synthesis, which then increases calcium and phosphate reabsorption from the gut.

Diseases and Disorders of Parathyroid Gland

The following are some of the disorders and diseases associated with the parathyroid gland;

1. Primary Hyperparathyroidism

- Primary hyperparathyroidism is a common disorder that affects about 2% of the population over the age of 55, especially in women than in men.
- It results from adenoma, hypertrophy of the glands as well as carcinoma. The hypersecretion of the hormone results in hypercalcemia and weak bones.
- Primary hyperparathyroidism is easier to diagnose as these can be detected by an increased level of calcium ions in the blood.

2. Secondary hyperparathyroidism

- Secondary hyperparathyroidism is characterized by appropriate secretion of parathormone as a result of low calcium levels.

- However, the increased secretion might lead to hypercalcemia followed by primary hyperparathyroidism.
- The symptoms of secondary hyperparathyroidism include kidney stones, bone pain, and gastroesophageal reflux.

3. Hypoparathyroidism

- Hypoparathyroidism is a condition characterized by the decreased release of parathyroid hormone.
- The condition results in hypocalcemia, hyperphosphatemia, and increased calcium ions.
- It might result from different factors that can be genetic, autoimmune, or other diseases.
- It has been observed that chronic hypoparathyroidism can lead to tetany, seizures as well as distorted bone microarchitecture.

4. Parathyroid Carcinoma

- Parathyroid carcinoma is a rare malignancy resulting in other conditions like primary hyperparathyroidism in middle-aged adults.
- The carcinoma might result in both renal as well as skeletal symptoms like renal colic, polyuria, fractures, and osteopenia.
- The definitive diagnosis of parathyroid carcinoma can be made by surgical resection with subsequent histological analysis.