

## Hyperparathyroidism (Primary)

Hyperparathyroidism is a disorder of one or more of the parathyroid glands. Usually, four parathyroid glands are located in the neck, two on each side. Rarely, a person has 5 or 6 parathyroid glands in the neck, and occasionally one or more parathyroid glands are located within the chest cavity. These small glands secrete a hormone called parathyroid hormone (or PTH) that helps the body maintain a normal blood calcium level.

When the blood calcium level drops, the parathyroid glands release PTH, raising the blood calcium level. The blood calcium level is normally maintained by the kidneys, bones, and indirectly by the intestines. When the blood calcium level rises, less PTH is released by the parathyroid glands, causing the kidneys to retain less calcium. These actions help keep the body's calcium level within a normal range.

In hyperparathyroidism, one or more of the parathyroid glands becomes overactive and secretes excess amounts of PTH. As a result, the blood calcium rises to a level that is higher than normal (called hypercalcemia).

**Causes** — Hyperparathyroidism can be caused by several conditions, including:

- A non-cancerous tumor (an adenoma) in one of the parathyroid glands; this is the most common cause.
- Enlargement of one or more of the parathyroid glands due to an overgrowth of normal cells, called hyperplasia.
- Parathyroid cancer; this is rare and accounts for less than 1 percent of all cases.

Hyperparathyroidism can occur at any age, but is more common in older postmenopausal women.

At young ages, hyperparathyroidism is often caused by a familial hyperparathyroidism syndrome, which usually causes parathyroid gland enlargement rather than adenoma. In familial hyperparathyroidism, there is also a possibility of abnormalities of other endocrine glands, including the pituitary, thyroid, pancreas, or adrenal glands.

The reason hyperparathyroidism develops is unknown. Risk factors include a prior history of radiation exposure to the neck or head. Medications such as lithium and thiazide diuretics can “unmask” hyperparathyroidism, probably because of their effect on calcium balance in the body.

**Symptoms** — About 80 percent of people with hyperparathyroidism have few or no symptoms. In these people, hyperparathyroidism is typically detected when a blood test is done for some other reason. Most often, the calcium level is only mildly elevated or is elevated intermittently. However, there are sometimes non-specific symptoms that might be related to the elevated calcium level, including:

- Joint aches
- Fatigue
- Weakness
- Loss of appetite
- Mild depression
- Difficulty concentrating

Symptoms become more noticeable as the PTH and blood calcium levels rise. At higher levels of PTH and blood calcium, there may be a significant loss of appetite, nausea, constipation, excessive thirst, or frequent urination. In addition, a person may develop:

- Impaired kidney function — the elevated calcium level can affect the renal tubules, impairing the kidney’s ability to filter blood.

- Kidney stones — as calcium levels rise, the kidneys excrete more calcium into the urine, which can cause kidney stones to develop.
- Bone disease — as calcium is reabsorbed from bone, bone density may decrease. As a result, the risk of bone fractures may increase in some patients.
- Rheumatologic symptoms — Gout or hardening (calcification) of cartilage in the wrists or knees can sometimes occur.
- Imbalances in other chemicals — some people develop a decreased blood phosphate level and a slightly increased magnesium level.

In developing countries, where calcium testing is not routine, hyperparathyroidism is usually detected when a person develops kidney stones or bone disease (bone pain and fractures).

Parathyroid crisis — Parathyroid crisis is a rare condition that sometimes occurs when people with hyperparathyroidism experience another illness, like vomiting or diarrhea, which causes excessive fluid loss or severely limits the amount of fluid they can consume.

During parathyroid crisis, blood PTH and calcium levels rise sharply, causing severe symptoms of hypercalcemia. Most notably, there is a significant change in thinking and alertness, ranging from confusion to coma. Some people also experience severe abdominal pain, nausea, vomiting, stomach ulcers, and pancreatitis (inflammation of the pancreas).

Parathyroid crisis must be treated quickly by replacing lost body fluids and removing the overactive parathyroid tissue.

**Diagnosis** — Hyperparathyroidism is diagnosed based upon levels of blood calcium and PTH. In most people with hyperparathyroidism, both levels are higher than normal.

Occasionally, a person may have an elevated calcium level and a normal or minimally elevated PTH level. Since PTH should be low when calcium is elevated, however, this finding is considered abnormal and indicates hyperparathyroidism.

## **Treatment**

**Non-surgical treatment** — Non-surgical treatment may be recommended for people who have no symptoms and whose blood calcium is only mildly elevated. Blood calcium levels should be measured every six months, and tests of renal function and bone density are recommended once per year.

Testing for “silent” kidney stones is recommended when a person is first diagnosed with hyperparathyroidism; this usually involves an ultrasound or CT scan of the kidneys. Further testing for kidney stones is not needed unless a person develops signs or symptoms of a stone.

**Bone density testing** — Dual x-ray absorptiometry (DXA) testing is the most commonly used method for measuring bone density because it provides precise measurements at important bone sites (eg, spine, hip, forearm) and uses minimal radiation.

During DXA, the person lies on an examination table. The test causes no discomfort, and usually takes only 5 to 10 minutes. The bone mineral density is then compared with the normal range for the person’s sex and race.

The World Health Organization (WHO) has defined normal bone density as a value within one standard deviation (SD) from average peak bone mass. Standard deviation is a statistical measure that defines how much a person’s result differs from the “average” young adult.

- **Normal bone density** — Bone density that is between 0 and 1 standard deviation below the mean is considered to be normal.

This may be reported as a T-score of 0 to -1. Treatment is not usually recommended for people with normal bone density, although preventive measures (eg, calcium supplementation, weight-bearing exercise) are recommended to prevent osteopenia and osteoporosis.

- Osteopenia — Bone density that is between 1 and 2.5 standard deviations below the mean is called osteopenia. This may be reported as a T-score of -1 to -2.4. A person with osteopenia does not yet have osteoporosis, but is at risk to develop it if not treated.
- Osteoporosis — Osteoporosis is defined as BMD more than 2.5 standard deviations (SD) below the mean of normal young women. This is reported as a T-score of -2.5 or less. The lower the bone density, the greater the risk of fracture.

General measures — Patients with hyperparathyroidism who do not have symptoms are advised to:

- Avoid lithium (a mood stabilizer used for bipolar illness) and thiazide diuretics (used to treat high blood pressure) since these drugs may further increase blood calcium levels.
- Avoid excessive loss of body fluids (eg, dehydration), prolonged bed rest or inactivity, and a high calcium diet since these can increase blood calcium levels.
- Minimize bone resorption by remaining active.
- Drink an adequate amount of fluid throughout the day. This may help to minimize the risk of kidney stones.
- Maintain a moderate calcium intake (about 1000 mg/day). Lower calcium intake will stimulate more PTH secretion while higher calcium intake may worsen high calcium levels.

- Maintain a moderate vitamin D intake of 400 to 600 IU daily. Vitamin D deficiency can stimulate PTH secretion and bone resorption and should be avoided.

Treat bone loss — Medications that inhibit bone resorption may be prescribed if a patient has evidence of decreased bone density. These medications can protect the skeleton from the bone thinning effects of excess parathyroid hormone but will not normalize the calcium levels in the blood. Examples of these medications include:

- Bisphosphonates (alendronate, risedronate, or ibandronate)
- Selective estrogen receptor modulators (raloxifene)

A full discussion of treatments for osteoporosis is available separately. ([See "Patient information: Osteoporosis prevention and treatment"](#)).

Trials are currently ongoing to evaluate the safety and efficacy of drugs that decrease parathyroid hormone levels; this could reverse all the effects of hyperparathyroidism, including elevations in serum calcium levels.

Surgical treatment — Surgery is often recommended for people whose blood calcium is moderately elevated. Surgery is also recommended for people who are excreting a significant amount of calcium through their urine and for people with signs of impaired kidney function or decreased bone density. It is also recommended if the person is less than 50 years old or if periodic follow-up would be difficult (eg, if a person lived a great distance from a healthcare provider or travels to places where it is difficult to find medical care).

Traditional surgery — the surgery is usually performed while the person is under anesthesia. An incision is made in the lower neck measuring 5 to 10 cm (2 to 5 inches). All four parathyroid glands are examined; usually, at least one abnormal-appearing gland is removed while the normal-appearing glands are left in place.

Minimally invasive surgery — minimally invasive surgery can be performed in cases where one abnormal parathyroid gland has been located by a pre-operative imaging study. During the imaging study, a small dose of medication is injected into a vein. This medication is absorbed by parathyroid adenomas, allowing it to be detected by a scan.

The surgery can be performed under local nerve block, and is an alternative when one abnormal gland has been localized pre-operatively. This procedure is also a good alternative for patients who are at high-risk for general anesthesia. During the surgery, a small incision (2 to 4 cm or 0.8 to 1.8 inches) is made in the neck and the abnormal tissue is removed. The patient's blood level of PTH is tested before and immediately after removal to confirm that the PTH level drops significantly after the abnormal tissue is removed.

The advantage of minimally invasive surgery compared to traditional surgery is that it requires a smaller incision, less time under anesthesia, and a shorter hospital stay. This procedure is available for people who have a single adenoma (more than 80 percent of cases) and have no thyroid disease and no family history of multiple endocrine neoplasias. However, minimally invasive surgery requires an experienced surgeon and medical center.

Effectiveness of surgery — with an experienced endocrine surgeon, surgical treatment is effective in curing hyperparathyroidism in about 95 percent of patients. The complication rate associated with surgery is very low.

Complications could include temporary or permanent damage to the other parathyroid glands resulting in low calcium levels and/or temporary or permanent hoarseness. Patients are hospitalized for a short time after surgery, usually for less than two days.

Occasionally, some abnormal parathyroid tissue goes undetected and is not removed during the first operation. In this case, high calcium levels and symptoms of hyperparathyroidism persist after surgery.

Imaging studies are required to locate the abnormal parathyroid tissue. In some patients, parathyroid glands may be present in unusual locations, such as in the chest or in other regions of the neck. A second surgical procedure is usually required to remove remaining abnormal tissue.

Follow up care after surgery — Six to eight weeks after surgery, most clinicians recommend a blood test to measure the blood level of calcium and PTH. These tests are then repeated once per year to ensure that they remain normal and that abnormal tissue has not regrown. A bone density test may be recommended one year after surgery to guide treatment of bone loss (osteopenia or osteoporosis).

Calcium and Vitamin D for bone health  
Osteoporosis prevention and treatment