

Primary Hyperparathyroidism

What is primary hyperparathyroidism?

Primary hyperparathyroidism is a disorder of the parathyroid glands, also called parathyroids. “Primary” means this disorder originates in the parathyroid glands. In primary hyperparathyroidism, one or more of the parathyroid glands are overactive. As a result, the gland releases too much parathyroid hormone (PTH). The disorder includes the problems that occur in the rest of the body as a result of too much PTH—for example, loss of calcium from bones.

In the United States, about 100,000 people develop primary hyperparathyroidism each year.¹ The disorder is diagnosed most often in people between age 50 and 60, and women are affected about three times as often as men.²

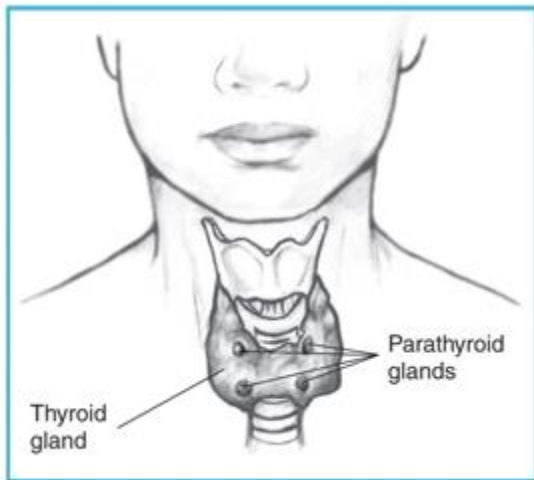
Secondary, or reactive, hyperparathyroidism can occur if a problem such as kidney failure causes the parathyroid glands to be overactive.

¹Bilezikian JP. Primary hyperparathyroidism. In: DeGroot LJ, ed.; Arnold A, section editor. *Diseases of Bone and Mineral Metabolism*. www.endotext.org website. South Dartmouth, MA: MDTEXT.COM, Inc. Accessed February 22, 2012.

²Silverberg SJ and Bilezikian JP. Primary hyperparathyroidism. In: Jameson JL and DeGroot LJ, senior eds. *Endocrinology: Adult and Pediatric*. 6th ed. (online version). Philadelphia: Saunders; 2010.

What are the parathyroid glands?

The parathyroid glands are four pea-sized glands located on or near the thyroid gland in the neck. Occasionally, a person is born with one or more of the parathyroid glands in another location. For example, a gland may be embedded in the thyroid, in the thymus—an immune system organ located in the chest—or elsewhere around this area. In most such cases, however, the parathyroid glands function normally.



The parathyroid glands are located on or near the thyroid gland in the neck.

The parathyroid glands are part of the body's endocrine system. Endocrine glands produce, store, and release hormones, which travel in the bloodstream to target cells elsewhere in the body and direct the cells' activity.

Though their names are similar, the thyroid and parathyroid glands are entirely different glands, each producing distinct hormones with specific functions. The parathyroid glands produce PTH, a hormone that helps maintain the correct balance of calcium in the body. PTH regulates the level of calcium in the blood, release of calcium from bone, absorption of calcium in the small intestine, and excretion of calcium in the urine.

When the level of calcium in the blood falls too low, normal parathyroid glands release just enough PTH to restore the blood calcium level.

What are the effects of high PTH levels?

High PTH levels trigger the bones to release increased amounts of calcium into the blood, causing blood calcium levels to rise above normal. The loss of calcium from bones may weaken the bones. Also, the small intestine may absorb more calcium from food, adding to the excess calcium in the blood. In response to high blood calcium levels, the kidneys excrete more calcium in the urine, which can lead to kidney stones.

High blood calcium levels might contribute to other problems, such as heart disease, high blood pressure, and difficulty with concentration. However, more research is needed to better understand

how primary hyperparathyroidism affects the cardiovascular system—the heart and blood vessels—and the central nervous system—the brain and spinal cord.

Why is calcium important?

Calcium is essential for good health. Calcium plays an important role in bone and tooth development and, combined with phosphorus, strengthens bones and teeth. Calcium also helps muscles contract and nerves transmit signals.

What causes primary hyperparathyroidism?

In about 80 percent of people with primary hyperparathyroidism, a benign, or noncancerous, tumor called an adenoma has formed in one of the parathyroid glands.² The tumor causes the gland to become overactive. In most other cases, the excess hormone comes from two or more overactive parathyroid glands, a condition called multiple tumors or hyperplasia. Rarely, primary hyperparathyroidism is caused by cancer of a parathyroid gland.

In most cases, health care providers don't know why adenoma or multiple tumors occur in the parathyroid glands. Most people with primary hyperparathyroidism have no family history of the disorder, but some cases can be linked to an inherited problem. For example, familial multiple endocrine neoplasia type 1 is a rare, inherited syndrome that causes multiple tumors in the parathyroid glands as well as in the pancreas and the pituitary gland. Another rare genetic disorder, familial hypocalciuric hypercalcemia, causes a kind of hyperparathyroidism that is atypical, in part because it does not respond to standard parathyroid surgery.

What are the symptoms of primary hyperparathyroidism?

Most people with primary hyperparathyroidism have no symptoms. When symptoms appear, they are often mild and nonspecific, such as

- muscle weakness
- fatigue and an increased need for sleep

- feelings of depression
- aches and pains in bones and joints

People with more severe disease may have

- loss of appetite
- nausea
- vomiting
- constipation
- confusion or impaired thinking and memory
- increased thirst and urination

These symptoms are mainly due to the high blood calcium levels that result from excessive PTH.

How is primary hyperparathyroidism diagnosed?

Health care providers diagnose primary hyperparathyroidism when a person has high blood calcium and PTH levels. High blood calcium is usually the first sign that leads health care providers to suspect parathyroid gland overactivity. Other diseases can cause high blood calcium levels, but only in primary hyperparathyroidism is the elevated calcium the result of too much PTH.

Routine blood tests that screen for a wide range of conditions, including high blood calcium levels, are helping health care providers diagnose primary hyperparathyroidism in people who have mild forms of the disorder and are symptom-free. For a blood test, blood is drawn at a health care provider's office or commercial facility and sent to a lab for analysis.

What tests may be done to check for possible complications?

Once the diagnosis of primary hyperparathyroidism is established, other tests may be done to assess complications:

- **Bone mineral density test.** Dual energy x-ray absorptiometry, sometimes called a DXA or DEXA scan, uses low-dose x rays to measure bone density. During the test, a person lies on a padded

table while a technician moves the scanner over the person's body. DXA scans are performed in a health care provider's office, outpatient center, or hospital by a specially trained technician and may be interpreted by a metabolic bone disease expert or radiologist—a doctor who specializes in medical imaging—or other specialists; anesthesia is not needed. The test can help assess bone loss and risk of fractures.

- **Ultrasound.** Ultrasound uses a device, called a transducer, that bounces safe, painless sound waves off organs to create an image of their structure. The procedure is performed in a health care provider's office, outpatient center, or hospital by a specially trained technician, and the images are interpreted by a radiologist; anesthesia is not needed. The images can show the presence of kidney stones.
- **Computerized tomography (CT) scan.** CT scans use a combination of x rays and computer technology to create three-dimensional (3-D) images. A CT scan may include the injection of a special dye, called contrast medium. CT scans require the person to lie on a table that slides into a tunnel-shaped device where the x rays are taken. The procedure is performed in an outpatient center or hospital by an x-ray technician, and the images are interpreted by a radiologist; anesthesia is not needed. CT scans can show the presence of kidney stones.
- **Urine collection.** A 24-hour urine collection may be done to measure selected chemicals, such as calcium and creatinine, which is a waste product healthy kidneys remove. The person collects urine over a 24-hour period, and the urine is sent to a laboratory for analysis. The urine collection may provide information on kidney damage, the risk of kidney stone formation, and the risk of familial hypocalciuric hypercalcemia.
- **25-hydroxy-vitamin D blood test.** This test is recommended because vitamin D deficiency is common in people with primary hyperparathyroidism.

How is primary hyperparathyroidism treated?

Surgery

Surgery to remove the overactive parathyroid gland or glands is the only definitive treatment for the disorder, particularly if the patient has a very high blood calcium level or has had a fracture or a kidney stone. In patients without any symptoms, guidelines are used to identify who might benefit from parathyroid surgery.³

When performed by experienced endocrine surgeons, surgery cures primary hyperparathyroidism in more than 95 percent of operations.²

Surgeons often use imaging tests before surgery to locate the overactive gland to be removed. The most commonly used tests are sestamibi and ultrasound scans. In a sestamibi scan, the patient receives an injection of a small amount of radioactive dye that is absorbed by overactive parathyroid glands. The overactive glands can then be viewed using a special camera.

Surgeons use two main strategies to remove the overactive gland or glands:

- **Minimally invasive parathyroidectomy.** This type of surgery, which can be done on an outpatient basis, may be used when only one of the parathyroid glands is likely to be overactive. Guided by a tumor-imaging test, the surgeon makes a small incision in the neck to remove the gland. The small incision means that patients typically have less pain and a quicker recovery than with more invasive surgery. Local or general anesthesia may be used for this type of surgery.
- **Standard neck exploration.** This type of surgery involves a larger incision that allows the surgeon to access and examine all four parathyroid glands and remove the overactive ones. This type of surgery is more extensive and typically requires a hospital stay of 1 to 2 days. Surgeons use this approach if they plan to inspect more than one gland. General anesthesia is used for this type of surgery.

Almost all people with primary hyperparathyroidism who have symptoms can benefit from surgery. Experts believe that those without symptoms but who meet guidelines for surgery will also benefit

from surgery. Surgery can lead to improved bone density and fewer fractures and can reduce the chance of forming kidney stones. Other potential benefits are being studied by researchers.

Surgery for primary hyperparathyroidism has a complication rate of 1–3 percent when performed by experienced endocrine surgeons.⁴ Rarely, patients undergoing surgery experience damage to the nerves controlling the vocal cords, which can affect speech. A small number of patients lose all their healthy parathyroid tissue and thus develop chronic low calcium levels, requiring lifelong treatment with calcium and some form of vitamin D. This complication is called hypoparathyroidism. The complication rate is slightly higher for operations on multiple tumors than for a single adenoma because more extensive surgery is needed.

People with primary hyperparathyroidism due to familial hypocalciuric hypercalcemia should not have surgery.

³Bilezikian JP, Khan A, Potts Jr JT. Guidelines for the management of asymptomatic primary hyperparathyroidism: summary statement from the Third International Workshop. *Journal of Clinical Endocrinology and Metabolism*. 2009;94(6):335–339.

⁴Udelsman R, Pasiaka JL, Sturgeon C, Young JEM, and Clark OH. Surgery for asymptomatic primary hyperparathyroidism: proceedings of the Third International Workshop. *Journal of Clinical Endocrinology and Metabolism*. 2009;94(2):366–372.

Monitoring

Some people who have mild primary hyperparathyroidism may not need immediate or even any surgery and can be safely monitored. People may wish to talk with their health care provider about long-term monitoring if they

- are symptom-free
- have only slightly elevated blood calcium levels
- have normal kidneys and bone density

Long-term monitoring should include periodic clinical evaluations, annual serum calcium measurements, annual serum creatinine measurements to check kidney function, and bone density measurements every 1 to 2 years.

Vitamin D deficiency should be corrected if present. Patients who are monitored need not restrict calcium in their diets.

If the patient and health care provider choose long-term monitoring, the patient should

- drink plenty of water
- exercise regularly
- avoid certain diuretics, such as thiazides

Either immobilization—the inability to move due to illness or injury—or gastrointestinal illness with vomiting or diarrhea that leads to dehydration can cause blood calcium levels to rise further in someone with primary hyperparathyroidism. People with primary hyperparathyroidism should seek medical attention if they find themselves immobilized or dehydrated due to vomiting or diarrhea.

Medications

Calcimimetics are a new class of medications that decrease parathyroid gland secretion of PTH. The calcimimetic, cinacalcet (Sensipar), has been approved by the U.S. Food and Drug Administration for the treatment of secondary hyperparathyroidism caused by dialysis—a blood-filtering treatment for kidney failure—and primary hyperparathyroidism caused by parathyroid cancer. Cinacalcet has also been approved for the management of hypercalcemia associated with primary hyperparathyroidism.

A number of other medications are being studied to learn whether they may be helpful in treating primary hyperparathyroidism. These medications include bisphosphonates and selective estrogen receptor modulators.

Which health care providers specialize in treating primary hyperparathyroidism?

Primary hyperparathyroidism is treated by endocrinologists—doctors who specialize in hormonal problems—and nephrologists—doctors who specialize in kidney disorders. Surgery for primary hyperparathyroidism is generally performed by endocrine surgeons; head and neck surgeons; and ear, nose, and throat surgeons. Organizations that help people with primary hyperparathyroidism may have additional information to assist in finding a qualified health care provider nearby. Some of these organizations are listed in the “For More Information” section.

Eating, Diet, and Nutrition

Eating, diet, and nutrition have not been shown to play a role in causing or preventing primary hyperparathyroidism.

Vitamin D. Experts suggest correcting vitamin D deficiency in people with primary hyperparathyroidism to achieve a serum level of 25-hydroxy-vitamin D greater than 20 nanograms per deciliter (50 nanomoles per liter). Research is ongoing to determine optimal doses and regimens of vitamin D supplementation for people with primary hyperparathyroidism.

For the healthy public, the Institute of Medicine (IOM) guidelines for vitamin D intake are

- people ages 1 to 70 years may require 600 International Units (IUs)
- people age 71 and older may require as much as 800 IUs

The IOM also recommends that no more than 4,000 IUs of vitamin D be taken per day.

Calcium. People with primary hyperparathyroidism without symptoms who are being monitored do not need to restrict calcium in their diet. People with low calcium levels due to loss of all parathyroid tissue from surgery will need to take calcium supplements for the rest of their life.

To help ensure coordinated and safe care, people should discuss their use of complementary and alternative medicine practices, including their use of dietary supplements, with their health care provider. Tips for talking with health care providers are available at the National Center for Complementary and Alternative Medicine's Time to Talk campaign at www.nccam.nih.gov.

Points to Remember

- Primary hyperparathyroidism is a disorder of the parathyroid glands, in which one or more of the parathyroid glands are overactive. As a result, the gland releases too much parathyroid hormone (PTH).
- High PTH levels trigger the bones to release increased calcium into the blood, causing blood calcium levels to rise above normal. The loss of calcium from bones may weaken the bones. In

response to high blood calcium levels, the kidneys excrete more calcium in the urine, which can lead to kidney stones.

- Most people with primary hyperparathyroidism have no symptoms. When symptoms appear, they are often mild and nonspecific, such as muscle weakness, fatigue, increased need for sleep, feelings of depression, or aches and pains in bones and joints.
- People with more severe primary hyperparathyroidism may have symptoms such as loss of appetite, nausea, vomiting, constipation, confusion or impaired thinking and memory, and increased thirst and urination.
- Health care providers diagnose primary hyperparathyroidism when a person has high blood calcium and PTH levels.
- Surgery to remove the overactive parathyroid gland or glands is the only definitive treatment for the disorder. When performed by experienced endocrine surgeons, surgery cures primary hyperparathyroidism in more than 95 percent of operations. Some people who have mild primary hyperparathyroidism may not need immediate or even any surgery and can be safely monitored. People with primary hyperparathyroidism due to familial hypocalciuric hypercalcemia should not have surgery.


Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) conducts and supports research into many kinds of disorders, including endocrine disorders such as primary hyperparathyroidism. Researchers are working to better understand the causes and the consequences of the disorder and are studying various treatment options. For example, scientists are trying to determine the mechanisms by which PTH weakens bones in primary hyperparathyroidism. Also, clinical trials are under way to study vitamin D supplementation in people with primary hyperparathyroidism and to determine the effects of primary hyperparathyroidism on the heart and blood vessels. More information about these clinical trials, funded under National Institutes of Health clinical trial numbers NCT01306656, NCT01329666, and NCT00432939, can be found at www.ClinicalTrials.gov.

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit www.ClinicalTrials.gov.

For More Information


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Acknowledgments

Publications produced by the NIDDK are carefully reviewed by both NIDDK scientists and outside experts. This publication was reviewed by John P. Bilezikian, M.D., Columbia University, and Stephen Marx, M.D., of the NIDDK.

You may also find additional information about this topic by visiting MedlinePlus at www.medlineplus.gov.

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NIH Publication No. 12-3425

August 2012

Page last updated August 14, 2012