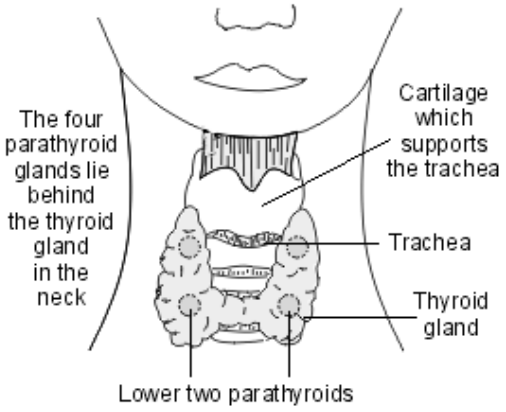
View this article online at: patient.info/hormones/thyroid-and-parathyroid-glands/hyperparathyroidism

# Hyperparathyroidism

Hyperparathyroidism occurs when too much parathyroid hormone is released by the parathyroid glands in the neck. It generally leads to high levels of calcium in the blood. This can cause various symptoms, commonly tiredness, feeling sick (nausea), being sick (vomiting), kidney stones and bone pains. It can usually be treated with surgery.

## What is hyperparathyroidism?

In hyperparathyroidism, your parathyroid glands make and release too much parathyroid hormone. Generally, this means that the calcium level in your blood becomes too high.




Your body has four parathyroid glands. They are small, pea-sized glands, located in your neck just behind your butterfly-shaped thyroid gland. Two parathyroid glands lie behind each 'wing' of your thyroid gland.

Your parathyroid glands release a hormone called parathyroid hormone. This hormone helps to control the levels of two chemicals in your body: calcium and phosphate.

Normally, parathyroid hormone is released when the level of calcium in your blood is low. When the calcium level rises and is back to normal, parathyroid hormone stops being released.

Parathyroid hormone has a number of effects in your body:

- It causes bone to release calcium.
- It causes calcium to be taken up into your blood (absorbed) from your gut (small intestine).
- It stops your kidneys from getting rid of (excreting) calcium in your urine.
- It causes your kidneys to excrete phosphate in your urine.

## Hyperparathyroidism symptoms

Often people with primary hyperparathyroidism either have no symptoms, or only have mild symptoms. You may only find out that you have hyperparathyroidism because blood tests that are carried out for another reason show a high level of calcium in your blood.

If you have primary or tertiary hyperparathyroidism and do develop symptoms, these are due to a high level of calcium in your blood (hypercalcaemia). They can include:

- Tiredness.
- Weak and easily tired muscles.
- Feeling sick (nausea), being sick (vomiting) and feeling off your food.
- Constipation.
- Tummy (abdominal) pain.
- Feeling very thirsty and passing urine frequently.
- Depression/low mood.

In extreme cases, if left untreated, a high calcium level can lead to confusion, loss of consciousness, heart rhythm disturbances and, rarely, death. You may also have high blood pressure if you have hyperparathyroidism. It is unclear why this happens.

If you have secondary hyperparathyroidism, your calcium level is not high but low, so you do not develop all of the symptoms described above. However, you can develop bone complications (see below) and the symptoms related to that.

## Causes of hyperparathyroidism

Hyperparathyroidism is either primary, secondary or tertiary.

### Primary hyperparathyroidism

In primary hyperparathyroidism, one or more of your parathyroid glands become enlarged and overactive. The gland, or glands, release too much parathyroid hormone. This results in a high level of calcium in your blood.

Causes include:

- **A single parathyroid adenoma**. This is the most common cause of primary hyperparathyroidism. There is a non-cancerous (benign) tumour of one of your parathyroid glands. This causes the gland to release more parathyroid hormone than it should.
- **Hyperplasia affecting more than one parathyroid gland**. This accounts for most other cases of primary hyperparathyroidism. Hyperplasia means that the parathyroid gland has become bigger. It usually affects more than one gland at the same time. As a result of the increase in size, more parathyroid hormone is released.
- **Parathyroid carcinoma**. Very rarely, primary hyperparathyroidism is caused by cancer in one of the parathyroid glands.

It is usually not clear why parathyroid adenoma or hyperplasia occurs. However, if you have had radiotherapy treatment to your head or neck in the past, you seem to have an increased chance of developing a parathyroid adenoma or carcinoma. Primary hyperparathyroidism seems to be more common in women than in men and most commonly affects women after the menopause.

Primary hyperparathyroidism does not usually run in families. However, in a very small number of people, it can be the result of an inherited condition called familial isolated hyperparathyroidism. Also, rarely, it may be inherited as part of a collection of problems (a syndrome) called multiple endocrine neoplasia (MEN) which affects the parathyroids, the pancreas and the pituitary gland.

### Secondary hyperparathyroidism

Secondary hyperparathyroidism is caused by other diseases or deficiencies that are affecting your body. These other conditions are ones that cause a long-standing, low level of calcium in your blood. This means that your parathyroid glands are being stimulated all the time to try to increase your blood calcium level.

As a result, your parathyroid glands enlarge and their output of parathyroid hormone increases. The raised levels of parathyroid hormone are appropriate due to the low level of calcium in your blood.

Some of the causes of secondary hyperparathyroidism include:

- **Chronic kidney disease (CKD)** - the most common cause of secondary hyperparathyroidism. Secondary hyperparathyroidism occurs in nearly everyone who is on long-term kidney dialysis because of stage 5 CKD. When this happens, your blood calcium level can become low and stay low. See the separate leaflet called Chronic Kidney Disease for more details.
- **Vitamin D deficiency (rickets/osteomalacia)** - another common cause. Vitamin D deficiency causes a long-standing low level of calcium in your blood. See the separate leaflet called Vitamin D Deficiency for more details.
- **Gut (intestinal) malabsorption** - there are various diseases that can affect your gut and prevent the calcium that you eat from being taken up (absorbed) into your blood. This can cause your blood calcium level to become low and stay low.

### Tertiary hyperparathyroidism

This type of hyperparathyroidism occurs as a result of long-standing secondary hyperparathyroidism. In tertiary hyperparathyroidism, the condition that was causing your low blood calcium level and the secondary hyperparathyroidism, has been treated (or your blood calcium level has been brought back to normal).

However, your parathyroid glands continue to produce large amounts of parathyroid hormone. This is because they start to act by themselves (autonomously) and are no longer sensitive to your blood calcium level. They are not 'switched off' when your blood calcium level rises. This results in a high calcium level in your blood.

Tertiary hyperparathyroidism is typically seen in people who have stage 5 CKD. It can also persist even after a kidney transplant.

## Complications of hyperparathyroidism

Not everyone with hyperparathyroidism has complications. However, sometimes complications may develop. If you have primary or tertiary hyperparathyroidism, these complications are mostly due to a long-standing high level of calcium in your blood. They can include:

- **Kidney stones**. Small stones may be passed in the urine without you noticing. Larger stones may get stuck, causing pain in your loin area that you then feel in your groin. You may also notice blood in your urine. See the separate leaflet called Kidney Stones for more details.
- **Corneal calcification**. Calcium can collect (be deposited) in the surface covering of your eye (cornea). This doesn't usually cause any symptoms.
- **Pancreatitis**. This is inflammation of your pancreas gland. Rarely, a high level of calcium due to hyperparathyroidism can cause pancreatitis. This can cause severe upper tummy (abdominal) pain. See the separate leaflet called Acute Pancreatitis for more details.
- **Stomach (peptic) ulceration**. A high calcium level can make your stomach produce too much acid and lead to stomach ulceration. See the separate leaflet called Stomach Ulcer (Gastric Ulcer) for more details.

- **Kidney damage**. A prolonged high calcium level in your blood can damage your kidneys and cause CKD.

In all types of hyperparathyroidism (including secondary hyperparathyroidism), the increased level of parathyroid hormone circulating in your blood causes high amounts of calcium to be released from your bones. This can cause weakness and 'thinning' of your bones - a condition known as osteopenia or, if more severe, osteoporosis. Your bones may become more susceptible to breaks or fractures. See the separate leaflet called Osteoporosis for more details.

## How is hyperparathyroidism diagnosed?

Hyperparathyroidism is usually diagnosed after blood tests have shown a high level of calcium and a high level of parathyroid hormone. Usually, the level of phosphate in your blood is low.

If you have secondary hyperparathyroidism, your blood calcium level may be low or normal but you will still have a raised parathyroid hormone level. If you also have CKD, your blood phosphate level can be high because your kidney cannot get rid of (excrete) phosphate in your urine.

Your doctor may have suggested these blood tests because you have one of the complications of hyperparathyroidism, such as kidney stones or pancreatitis. They may also have suggested that your blood calcium level be tested for another reason. For example, if you have symptoms of low mood, tiredness, constipation or feeling thirsty. These may be possible symptoms of a high blood calcium level caused by hyperparathyroidism. However, these symptoms can also occur for a number of other reasons.

## Further investigations

Once blood tests have shown that you have hyperparathyroidism, you doctor will usually want to confirm which type of hyperparathyroidism you have and to look for a possible cause. They may also want to look for any complications that you may have. You will usually be referred for further tests to a doctor who is a specialist. Investigations may include:

- **Further blood tests**. These can include blood tests to check your kidney function, your pancreas gland and your bones.

- **Urine calcium level**. You may be asked to collect your urine in a special container over a 24-hour period to measure the amount of calcium in your urine. You usually pass more calcium in your urine in hyperparathyroidism.
- DXA scan. Because hyperparathyroidism can cause 'thinning' of your bones (osteopenia/osteoporosis), you may be referred for a special scan to assess your bone thickness. This is called a dual-energy X-ray absorptiometry (DXA, or DEXA) scan.
- X-rays. These can show changes in your bones due to the increased release of calcium from them. X-rays can also show kidney stones.
- **Kidney** ultrasound scan. This can show any kidney stones.
- **Ultrasound,** CT **or technetium scan of your neck**. These can show if you have an enlarged parathyroid gland or glands. You may have a scan if surgery is planned (see below).
- Biopsy **of a parathyroid gland**. A biopsy of one of your parathyroid glands may be suggested. This is a sample that is taken from the gland, using a needle. It is usually carried out using scanning, such as ultrasound, to guide the doctor who is taking the biopsy. A biopsy may help to exclude parathyroid cancer (carcinoma).

# Hyperparathyroidism treatment

The treatment that you have depends on the type of hyperparathyroidism.

### Primary hyperparathyroidism treatment

There are some different options for treating primary hyperparathyroidism. These include:

#### Regular monitoring of your symptoms

If you have mild primary hyperparathyroidism, with a mildly raised calcium level and no symptoms, your doctor may just suggest that you be regularly monitored. This means having regular blood tests to check your blood calcium level and kidney function, regular blood pressure checks and monitoring for any symptoms that you may have.

It may also include DXA bone scanning as described above. This monitoring approach is considered controversial by some. You should discuss the pros and cons with your doctor.

### Surgery (parathyroidectomy)

There are guidelines to help decide when someone with hyperparathyroidism should have surgery to remove the abnormal parathyroid gland or glands (parathyroidectomy).

For example, if your hyperparathyroidism is more severe, your bones have become too thin, or if you have carcinoma of your parathyroid glands, your doctor may suggest surgery. If you have a single overactive gland then just this is removed. However, if you have more than one overactive parathyroid gland, all abnormal glands need to be removed.

If all four parathyroid glands are overactive, usually three and a half of the glands are removed so that you have some remaining parathyroid tissue. Your calcium level will need close monitoring after surgery to ensure that it returns to normal and does not drop too low.

### Medication

This is used in people with more severe hyperparathyroidism who choose not to have surgery, or who do not meet the guidelines for surgery. Treatment aims to improve bone thickness (density) and correct a high calcium level.

Various medicines may be used. These include a group of medicines called bisphosphonates. Another medicine called cinacalcet can help to reduce calcium and parathyroid hormone levels and increase the phosphate level in your blood. However, it does not seem to improve bone density.

Sometimes hormone replacement therapy may be suggested if you are a postmenopausal woman, especially if you also have menopausal symptoms.

## Secondary hyperparathyroidism treatment

If you develop secondary hyperparathyroidism, it should be treated early to prevent bone complications from developing and also to reduce the chance of developing tertiary hyperparathyroidism. The underlying condition that is causing secondary hyperparathyroidism needs to be treated; for example, treating vitamin D deficiency with vitamin D supplements.

CKD is the most common cause of secondary hyperparathyroidism. Treatment in CKD includes:

**Treatment to lower your blood phosphate level**

You can reduce your intake of phosphate by restricting the amount of milk, cheese, eggs and dairy products that you eat. You may also need some medication such as calcium carbonate. This binds to phosphate and helps to stop it being absorbed from your gut (small intestine) after you have eaten.

**Treatment to raise your calcium level**

You will need to start supplements containing calcium and vitamin D in order to raise your blood calcium level. You need to take an 'active' form of vitamin D to allow calcium to be absorbed successfully from the food that you eat. Normally, vitamin D is converted to this 'active' form by the kidney. However, if you have severe kidney disease, this conversion cannot happen.

**Cinacalcet**

This medicine reduces the release of parathyroid hormone by the parathyroid glands. It is sometimes used if you have secondary hyperparathyroidism due to long-standing kidney disease and other treatments have not been effective, and surgery is not an option for some reason.

Surgery to remove abnormal parathyroid glands may be considered if secondary hyperparathyroidism is severe and does not respond to medical treatment.

## Tertiary hyperparathyroidism treatment

The ideal situation is that tertiary hyperparathyroidism does not develop because secondary hyperparathyroidism is successfully treated. However, if it does develop, the treatment of tertiary hyperparathyroidism is usually surgery to remove the overactive parathyroid glands.

Often, a small amount of one of the glands is transplanted into one of your forearms. This means that some remaining parathyroid gland tissue is left in your body to control calcium levels but it is easy to get to if further surgery is needed.

## Possible complications after surgery

Complications after surgery to remove parathyroid glands are not very common. However, in some people, complications may occur. They include:

- **A low calcium level (hypocalcaemia)**. Sometimes after surgery, because your bones are 'hungry', calcium and phosphate can be rapidly removed from your blood and deposited in your bones. This can lead to a low blood calcium level because your remaining normal parathyroid glands aren't working properly yet - they are underactive (hypoparathyroidism). The low blood calcium level goes back up to normal when your remaining normal parathyroid glands become sensitive again and can control your blood calcium level. However, sometimes hypoparathyroidism can persist and some people need long-term medication treatment with calcium and vitamin D supplements.
- **Nerve damage in the neck**. Damage to one of the nerves in your neck, called the recurrent laryngeal nerve, can sometimes occur during the operation. This can cause a cough and a hoarse voice.
- **Bleeding**. This can sometimes occur after surgery. Rarely, the blood can collect in your neck and put pressure on your airway, causing breathing difficulties. This needs quick treatment to remove the blood clot.
- **Infection**. After any type of surgery this is a possible complication.
- **Persisting hyperparathyroidism**. Occasionally, surgery is unsuccessful and hyperparathyroidism is not adequately treated.

## Self-care

There are some things that you can do if you have hyperparathyroidism:

- Make sure that you drink plenty of water and do not become lacking in fluid in the body (dehydrated).
- Avoid taking certain medicines such as some 'water tablets' (diuretics). If you are already taking diuretics, you should discuss this with your doctor.
- If you are confined to your bed (for example, after an accident or illness) or if you have an illness causing you to be sick (vomit) or to have diarrhoea, this can cause your calcium levels to rise further. If you have hyperparathyroidism you should seek medical attention quickly in these situations.

## What is the outlook for hyperparathyroidism?

In primary hyperparathyroidism, after successful surgery to remove the parathyroid glands (parathyroidectomy), the outlook (prognosis) is usually excellent and most people are cured. If you do not have symptoms and are followed up without surgery, there is also generally a good prognosis. Significant bone loss and other symptoms may not happen for many years when you are followed up.

However, if you have secondary or tertiary hyperparathyroidism, the prognosis tends to be worse. This is because it is usually caused by underlying stage 5 CKD.

## Why do we need calcium and phosphate?

Calcium and phosphate combine to make calcium phosphate in your body. This is the chief material that makes your bones and teeth hard and strong. Calcium is also needed as part of the complex mechanism that helps your blood to clot after an injury. As well, it is needed for your muscles and nerves to work properly. Phosphate works along with calcium for these functions. Phosphate is also needed for the production of energy within your body.

## Further reading


- Cinacalcet for the treatment of secondary hyperparathyroidism in patients with end-stage renal disease on maintenance dialysis therapy; NICE Technology Appraisal Guidance, January 2007
- Dulfer RR, Koh EY, van der Plas WY, et al; Parathyroidectomy versus cinacalcet for tertiary hyperparathyroidism; a retrospective analysis. Langenbecks Arch Surg. 2019 Feb;404(1):71-79. doi: 10.1007/s00423-019-01755-4. Epub 2019 Feb 7.
- Khan AA, Hanley DA, Rizzoli R, et al; Primary hyperparathyroidism: review and recommendations on evaluation, diagnosis, and management. A Canadian and international consensus. Osteoporos Int. 2017 Jan;28(1):1-19. doi: 10.1007/s00198-016-3716-2. Epub 2016 Sep 9.
- Cocchiara G, Fazzotta S, Palumbo VD, et al; The medical and surgical treatment in secondary and tertiary hyperparathyroidism. Review. Clin Ter. 2017 Mar-Apr;168(2):e158-e167. doi: 10.7417/CT.2017.1999.



**Disclaimer:** This article is for information only and should not be used for the diagnosis or treatment of medical conditions. Egton Medical Information Systems Limited has used all reasonable care in compiling the information but makes no warranty as to its accuracy. Consult a doctor or other healthcare professional for diagnosis and treatment of medical conditions. For details see our conditions.



| Authored by: | Peer Reviewed by:<br>Dr Colin Tidy, MRCGP | |
|---|---|---|
| Originally Published:<br>19/11/2023 | Next review date:<br>15/09/2023 | Document ID:<br>doc_8458 |


View this article online at: patient.info/hormones/thyroid-and-parathyroid-glands/hyperparathyroidism

Discuss Hyperparathyroidism and find more trusted resources at Patient.


Patient Access

To find out more visit www.patientaccess.com

or download the app

Download on the App Store GET IT ON Google Play

Follow us