

The Parathyroid Glands and Hypercalcaemia

A patient guide written by Dr Andrew Ong FRACS, Breast & Endocrine Surgeon

Most people have never heard of the parathyroid glands. Even patients who are familiar with the thyroid gland are often surprised to learn that four separate, entirely different glands sit just behind it. This guide explains what the parathyroid glands are, what they do, why abnormal calcium levels matter even when you feel reasonably well, and what can be done about it.

What are the parathyroid glands?

The parathyroid glands are four tiny structures, each roughly the size of a grain of rice, located on the back surface of the thyroid gland in the lower neck. Despite being in close proximity to the thyroid, they are entirely separate organs with a completely different function.

A normal parathyroid gland weighs only about 30 to 50 milligrams. Each gland is so small that they are difficult to see with the naked eye during surgery — and yet they perform one of the most tightly regulated functions in human physiology.

Note on the name: “Parathyroid” simply means “next to the thyroid”. The name describes their location, not their function. The parathyroid glands have nothing to do with producing thyroid hormone; that is the thyroid’s job.

What do the parathyroid glands do?

The parathyroid glands produce **parathyroid hormone (PTH)**. PTH has one primary job: to keep the level of calcium in the bloodstream within a precise, narrow range.

PTH does this through three main mechanisms:

- **Bone:** PTH signals bone to release calcium into the bloodstream when levels fall.
- **Kidneys:** PTH tells the kidneys to retain calcium rather than excrete it in the urine, and to activate vitamin D.
- **Gut (via vitamin D):** Activated vitamin D increases calcium absorption from food in the intestine.

This three-way feedback system runs continuously, with PTH levels rising and falling minute-by-minute in response to small changes in blood calcium. It is one of the most precisely calibrated hormonal systems in the body.

Why does the calcium level in the blood matter so much?

Calcium is not just a building block for bones. It plays a critical role in:

- Electrical activity in nerve and muscle cells — including the heart
- Muscle contraction, including the heart muscle
- Brain and cognitive function
- Blood clotting
- Hormone release

Because so many systems depend on calcium, the body cannot simply let its blood level drift. When it does — whether too high or too low — the consequences are felt across multiple organ systems at once.

My doctor found high calcium in my blood. What problems can this cause?

Elevated calcium in the blood is called **hypercalcaemia**. Its effects range from none at all — particularly in mild cases detected incidentally on routine blood tests — to serious, even life-threatening complications when severe or prolonged.

A useful way to remember the range of effects is the medical mnemonic: “bones, stones, groans, and psychic moans.”

	Effect	Why it happens
“Bones”	Bone thinning (osteopenia / osteoporosis) and fractures	<i>Calcium is leached from bones to maintain blood levels</i>
“Stones”	Recurrent kidney stones (nephrolithiasis)	<i>Excess calcium filtered by the kidneys can crystallise</i>
“Groans”	Abdominal pain, constipation, nausea, cramps	<i>High calcium slows gut motility and can irritate the bowel</i>
“Psychic moans”	Depression, fatigue, difficulty concentrating, anxiety	<i>Often the most subtle and underappreciated effect; may mimic other conditions</i>
Heart	Cardiac rhythm abnormalities (arrhythmias)	<i>Calcium is essential for normal cardiac conduction</i>

An important point about mild hypercalcaemia: Many patients with mildly elevated calcium feel broadly well, or attribute their symptoms — fatigue, low mood, mild memory difficulties — to ageing, stress, or other causes. The insidious nature of mild hypercalcaemia means it is frequently underdiagnosed or left untreated for years. This is precisely why your doctor has taken it seriously even if you feel relatively well.

What is causing my high calcium?

The most common cause of hypercalcaemia is **primary hyperparathyroidism** — a condition in which one or more of the parathyroid glands becomes abnormally enlarged and starts producing too much PTH, independently of what the body actually needs. This drives blood calcium progressively higher.

In primary hyperparathyroidism, the abnormality lies within the parathyroid gland itself. The most common cause is a benign tumour of a single gland called an adenoma, which accounts for approximately 85% of cases. Less commonly, multiple glands are enlarged (multiglandular hyperplasia), and very rarely, a parathyroid carcinoma (cancer) is responsible.

Other less common causes of high calcium include: Certain cancers (which can release PTH-like substances); granulomatous diseases such as sarcoidosis; excessive vitamin D intake; excess calcium supplement use; and some medications. These are distinct from primary hyperparathyroidism and are managed differently. Your doctor/specialists may have ordered tests to help distinguish between these possibilities.

A note on vitamin D deficiency and “secondary” hyperparathyroidism: Vitamin D deficiency causes a different condition called secondary hyperparathyroidism, in which PTH rises appropriately in response to low calcium — it is a normal compensatory response, not a primary gland abnormality. Secondary hyperparathyroidism typically does not cause elevated calcium; in fact, calcium is usually normal or low. It is managed with vitamin D replacement, not surgery.

How is hypercalcaemia investigated?

The workup for hypercalcaemia can be extensive. The aim is to confirm the diagnosis, identify which gland or glands are responsible, assess the impact on target organs (bone, kidneys), and plan surgery precisely. Investigations may include:

Investigation	What it is looking for
Blood tests	Measure serum calcium, PTH, vitamin D, phosphate, and kidney function
Urine tests	Assess calcium excretion by the kidneys; helps distinguish causes of hypercalcaemia
Bone density scan (DEXA)	Measures the impact of high calcium on bone mineral density
Neck ultrasound	Initial imaging to identify enlarged parathyroid glands
4D-CT scan	Specialised CT that uses timing of contrast enhancement to precisely localise enlarged glands
Sestamibi scan (nuclear medicine)	A nuclear medicine imaging test in which overactive parathyroid glands absorb a radioactive tracer, making them visible on scan
Interventional radiology	Occasionally required in complex or re-operative cases to sample veins and measure PTH levels directly (venous sampling)

Not every patient requires every test. Dr Ong will tailor the investigation pathway to your specific situation. In many cases, a combination of blood tests, a neck ultrasound, and a sestamibi scan is sufficient to localise the abnormal gland before surgery.

What is the treatment for primary hyperparathyroidism?

The only definitive cure for primary hyperparathyroidism is surgery — a **parathyroidectomy**. There is no long-term medical treatment that corrects the underlying problem. Surgery involves making a small incision in the lower neck and removing the enlarged gland or glands. The operation is performed under general anaesthesia.

What does a parathyroidectomy involve, and is it a simple operation?

The complexity of parathyroidectomy varies considerably from patient to patient. The range is broad:

- **Straightforward cases:** A single enlarged gland is identified on pre-operative imaging, removed through a small focused incision, and the PTH level is confirmed to have fallen intra-

operatively. These operations typically take 30 to 60 minutes and are often performed as a day-only procedure.

- **Complex cases:** When imaging is inconclusive, when multiple glands are involved, or when the gland is in an unusual location, a more extensive exploration of the neck is required. These operations can take 2 to 3 hours and may occasionally necessitate removing part or all of the thyroid gland in order to access an unusually positioned parathyroid.

In cases of four-gland hyperplasia (where all four glands are enlarged), a **subtotal parathyroidectomy** may be performed, in which 3½ glands are removed, leaving a small remnant to preserve some parathyroid function.

Why this should be done by an experienced endocrine surgeon: The parathyroid glands are tiny, variable in number and location, and surrounded by critical structures including the thyroid, major blood vessels, and the recurrent laryngeal nerves (which control the voice). Parathyroidectomy is a highly specialised procedure. Cure rates, complication rates, and the likelihood of avoiding unnecessary exploration are all significantly better in the hands of high-volume endocrine surgeons.

Making an appointment

To see Dr Ong, you will need a referral from your general practitioner (GP) or treating specialist. Once you have your referral, please contact either of the following rooms:

Campbelltown / Macarthur rooms:

Suite 101, 1 Centennial Drive, Campbelltown NSW 2560

Phone: (02) 4610 7933

Macquarie University Hospital rooms:

Suite 301, 2 Technology Place, Macquarie University Hospital NSW 2109

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