TUMOURS OF THE PITUITARY GLAND

A guide for patients

The pituitary gland is important because it produces hormones that are essential for the control of other glands and many of the body's functions. If a tumour grows in the pituitary, these functions can become impaired because the tumour interferes with the production of normal levels of hormones. In addition, a large tumour can press on nearby structures in the brain, disrupting their function.

Pituitary tumours can be treated with medicines, surgery and radiotherapy. Most patients with a pituitary tumour that is causing symptoms will need surgery. Current surgical techniques have been very successful in safely gaining access to the pituitary.

Modern endoscopes (thin telescopes with a light and video camera), operating microscopes and special surgical instruments allow neurosurgeons to reach the pituitary through the nose. This results in less operating time, less surgical damage, greater likelihood of surgical success and cure, fewer complications, and a quicker recovery for patients.

Some pituitary tumours still require surgery via a craniotomy (a window in the skull) like most other brain tumours.

PITUITARY HORMONES

Anterior lobe of pituitary

- ACTH (adrenocorticotropic hormone): partly regulates the adrenal glands located at the top of both kidneys to release cortisol, a chemical essential for many of the metabolic processes in the body.
- TSH (thyroid stimulating hormone, thyrotropin): partly regulates the thyroid in the production of thyroid hormone, which affects the rate of energy usage.
- HGH (human growth hormone): has a major role in growth during childhood and repair of tissues in adulthood.
- FSH and LH (follicle stimulating hormone and luteinising hormone): in women, they control ovulation and the production of oestrogen and progesterone. In men, they control development of sperm and production of testosterone.
- Prolactin: in pregnancy, prepares the breasts for milk production. After birth, controls production of breast milk.

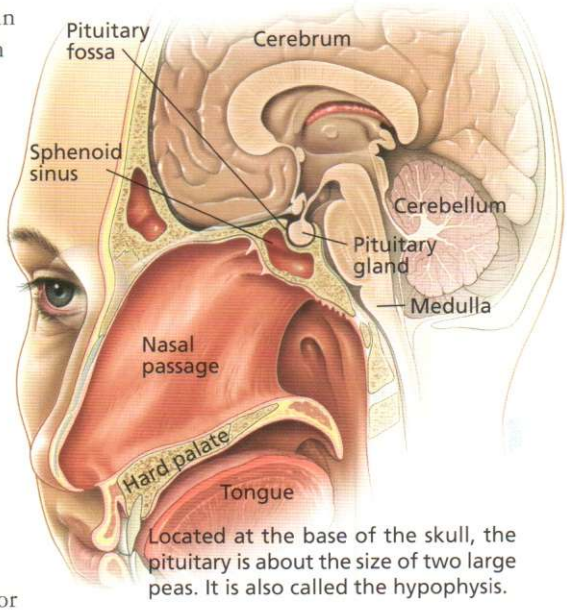
Posterior lobe of pituitary

- ADH (antidiuretic hormone or vasopressin): important in enhancing the kidneys' reabsorption of water in urine (to reduce the risk of dehydration) and maintaining the balance of water and salt in the blood and body fluids.
- Oxytocin: this hormone provokes contractions of the uterus during and after labour and the flow of milk during breast-feeding.

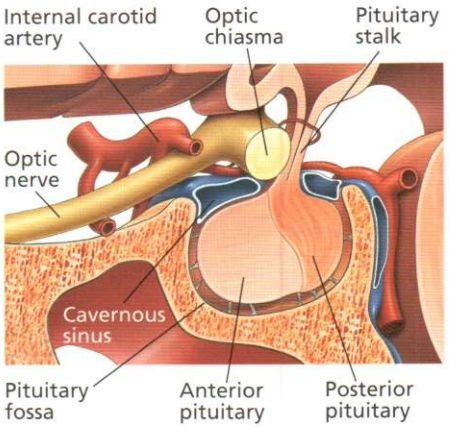
PITUITARY TUMOURS

The pituitary can give rise to different types of tumours. Doctors do not know the exact reasons why a pituitary develops disordered growth. As with most other tumours, the cause remains unknown.

Pituitary tumours tend to grow slowly and usually are non-cancerous (benign). Also called adenomas, most arise from the front (anterior) part of the pituitary. Malignant (cancerous) tumours of the pituitary are rare.



Located at the base of the skull, the pituitary is about the size of two large peas. It is also called the hypophysis.



Talk to your Surgeon

This pamphlet is intended to provide you with general information. It is not a substitute for advice from your surgeon and does not contain all the known facts about pituitary tumours. If you are not sure about the benefits, risks and limitations of treatment, ask your surgeon. Read this pamphlet carefully, and save it. Technical terms are used that may require further explanation by your surgeon. Write down questions you want to ask. Your surgeon will be pleased to answer them. Seek the opinion of another surgeon if you are uncertain about advice you are given. Use this pamphlet only in consultation with your surgeon.

Consent form: If you have surgery, your surgeon will ask you to sign a consent form. Before signing, read it carefully. If you have any questions, ask your surgeon.

Your Surgeon

IMPORTANT: Fill in all details on the sticker below.

DEAR SURGEON: When you hand this pamphlet to your patient, remove this sticker and put it on the patient's medical history or card. This will remind you and your patient that this pamphlet has been provided. Some surgeons ask their patients to sign the sticker to confirm receipt of the pamphlet.

PEEL HERE

TREATMENT INFORMATION PAMPHLET

PROCEDURE: _____

PATIENT'S NAME: _____

DOCTOR'S NAME: _____

EDITION NUMBER: _____ DATE: D D / M M / Y Y Y Y

Edition number: 1

Surgery of the Pituitary Gland

The aim of pituitary surgery is to remove as much of the tumour as possible.

To access the pituitary, the most common surgical approach is through the main nasal passage and the sphenoid sinus.

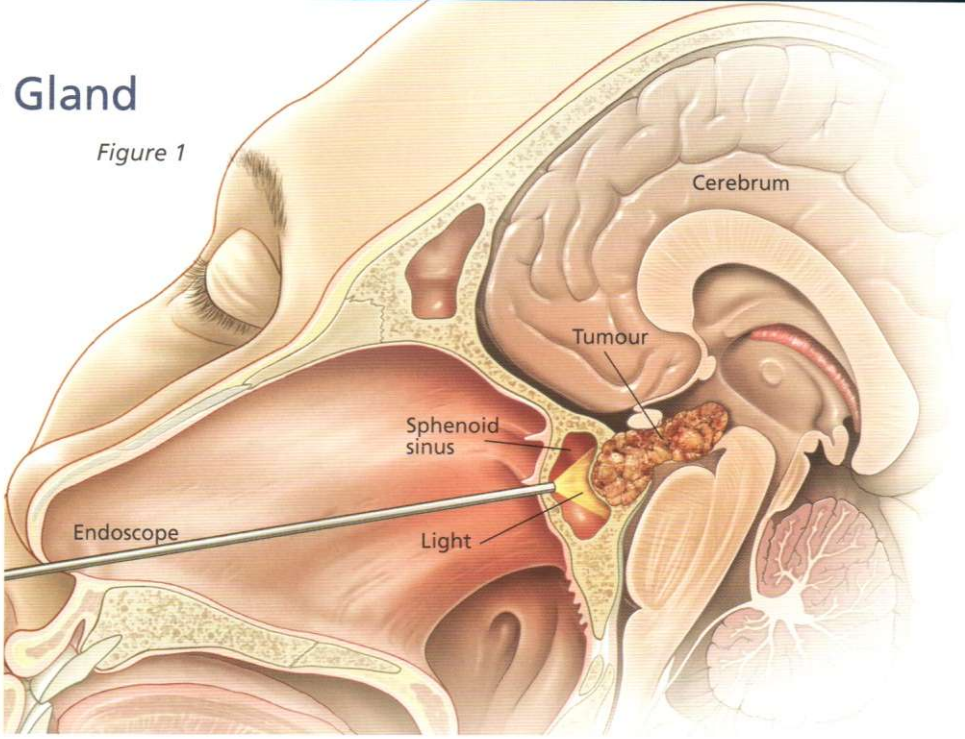
As shown in Figure 1, an endoscope is passed into the nasal passage to the sphenoid sinus. No skin incision is needed. As the endoscope provides good images, the surgeon can quickly identify the front wall of the sphenoid sinus. A hole is created in the front wall of the sinus so the surgeon can access the pituitary.

Using either the endoscope or an operating microscope, the surgeon opens the bony floor directly under the pituitary (Figure 2). Both methods provide the surgeon with good light, magnification and access.

The tumour is removed in small fragments using suction and special surgical instruments called curettes (Figure 3).

If the tumour is small, the surgeon can often remove virtually all the tumour without significant trauma to the pituitary. In larger tumours that require more surgery, the surgeon usually has to remove a significant portion of the pituitary. The surgeon tries to save as much pituitary tissue as possible. The surgeon is careful to protect blood vessels and nerves in the area.

Figure 1



At the top of the pituitary is a thin membrane that separates the gland from cerebrospinal fluid (CSF) of the brain. As this membrane is sometimes ruptured during surgery, it needs to be sealed so that CSF does not leak, posing an infection risk to the brain. To seal the hole, a small ball of fat is taken from the patient's abdomen or from the thigh and packed into the pituitary fossa as a plug (Figure 4).

Finally, the hole through the bony wall of the fossa is reconstructed, which may include bone from the patient, dissolvable plates (Figure 4), and tissue glue. The aim is to protect the pituitary and the brain, and minimise the risk of CSF leakage and infection of the CSF (meningitis).

The surgical procedure usually takes about three hours.

For some large tumours that have grown upwards into the brain, the removed to relieve most symptoms, for example, decompression of the optic nerve structures and restoration of normal or nearly normal vision.

Patients with large tumours of either type can have sudden bleeding (haemorrhage) into the tumour, known as pituitary apoplexy. This can cause serious headache, loss of vision, double vision, or failure of the pituitary.

FUNCTIONING AND NON-FUNCTIONING TUMOURS

Pituitary tumours are classified into two groups: functioning and non-functioning.

1 **Functioning (secretory) tumours:** These tumours produce an excess of one or two pituitary hormones. This can cause conditions such as:

- hyperprolactinaemia (excess of prolactin), causing irregular or absent periods in women, impotence in men, infertility in men and women, and breast-milk production in men and women. This is the most common type of pituitary tumour. Patients can often be managed by endocrinologists (physicians who treat gland and hormone disorders) without surgery using the medicines bromocriptine or cabergoline.
- acromegaly in adults and gigantism in children, caused by an excess of growth hormone.
- hyperthyroidism (excess of TSH).
- Cushing's syndrome (excess of ACTH).

The hormone produced depends on the type of cell in the pituitary that gave rise to the tumour. Functioning tumours may be discovered even when they are very small because they produce so much hormone, with resulting symptoms.

2 **Non-functioning tumours:** These do not produce hormones but cause problems because, as they grow larger, they press on the pituitary and nearby structures. This can cause:

- loss of vision when the tumour presses on the optic nerves, optic tract and optic chiasma, which lie above the pituitary. They are vulnerable because they are so close to the pituitary. Loss of peripheral vision is the most common symptom.
- hypopituitarism, which is caused by poor production of pituitary hormones.

Both functioning and non-functioning tumours can invade the tissues around the skull base, damaging the pituitary and causing a range of symptoms depending on location, including headache, double vision, tunnel vision, blindness or hydrocephalus.

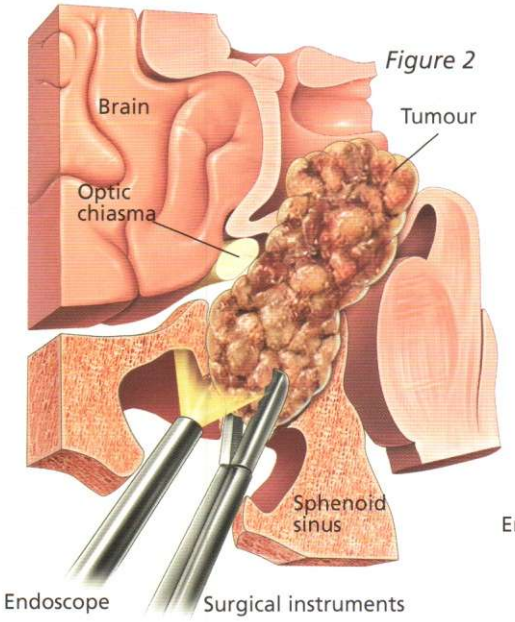
In some patients, the surgeon may not be able to remove all of the tumour, due to its size, location and growth around important nerves and blood vessels. However, enough of the tumour can usually be

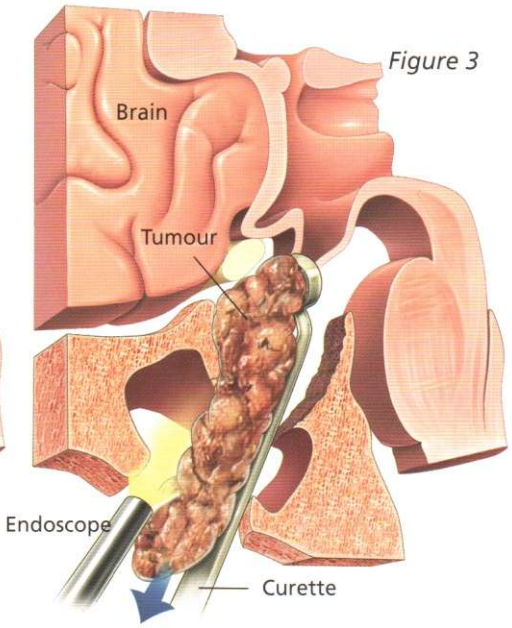
DIAGNOSIS

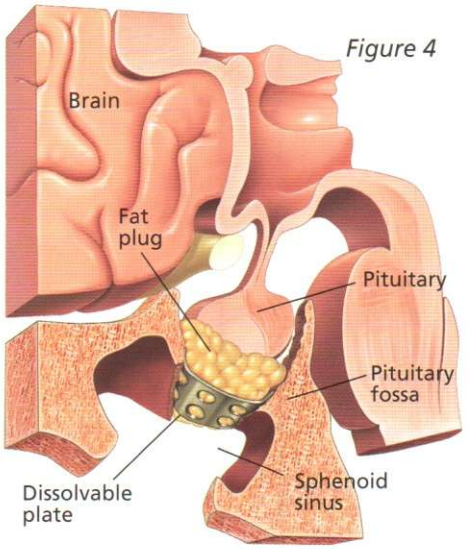
Blood tests: These can determine the blood levels of pituitary hormones, other hormones, and other factors.

Diagnostic imaging: Magnetic resonance imaging (MRI) is the investigation of choice. It provides images of the pituitary, the position and size of any tumour, and the anatomy of nearby structures. Computer tomography (CT) is sometimes helpful, particularly in imaging of the sphenoid sinus.

Eye specialist: If the patient has disruptions of vision, an eye specialist may determine which parts of the visual field are affected. This can be helpful in estimating which optic nerve structures are being compressed by the tumour.







surgeon may have to stage tumour removal into two operations. In the first stage, most of the tumour is removed. In the second stage, the rest of the tumour is removed when it falls into or near the pituitary fossa and can be accessed.

Uncommonly, in some patients, the surgical approach has to be through a craniotomy (an opening in the skull) or through the roof of the mouth. The surgeon can explain this situation further.

In many patients, the surgeon can remove all of the tumour, and the patient can be cured. This depends on the size, location and type of tumour. With some types of tumours, nine out of 10 patients are cured. However, with other types, the cure rate may be four or five patients out of 10. The surgeon can provide an estimate of the likelihood of cure in your case.

A surgical cure may not be possible in patients with large tumours that have grown deeper into the brain, because the surgeon cannot safely reach such a tumour. However, these tumours can often be removed sufficiently from optic-nerve structures so that vision is preserved.

If the tumour regrows and causes more symptoms, surgery will be required again. Recurrent tumours and inoperable tumours may have to be treated with radiation (that is, radiotherapy or radiosurgery) rather than standard surgery.

YOUR MEDICAL HISTORY

Your surgeon needs to know your medical history to plan the best treatment. Tell your surgeon about any health problems you have. Some may interfere with treatment, surgery, anaesthesia or recovery. Before surgery, tell your surgeon if you have had:

- a bad reaction to antibiotics, anaesthetic drugs or any other medicines
- prolonged bleeding or excessive bruising when injured, or a family history of excessive bleeding
- recent or long-term illness, and any previous surgery.

Give your surgeon a list of ALL medicines you are taking and have recently taken. Your surgeon may ask you to stop taking some medications for a week or more before surgery, or you may be given an alternative dose.

Smoking: Patients who smoke must stop for at least three weeks before surgery and three weeks after surgery. It is best to quit.

ANAESTHESIA

Pituitary surgery is performed under general anaesthesia. Modern anaesthesia does have risks, although the complication rates are low. Your anaesthetist can provide more information.

AFTER THE SURGERY

After you awaken, you may be transferred to a high dependency unit. Nursing staff will check your vital signs, fluid balance, bleeding from the nose or CSF leakage, and general well-being.

Expect to have some pain, discomfort, sinus headache, nasal congestion and tiredness. These symptoms typically improve quickly over the first day or so, and then steadily resolve over a few weeks. You are given medication to relieve pain.

With assistance, walk as soon and as often as possible. You may be well enough to be discharged 3 to 5 days after surgery.

Follow-up in hospital with an endocrinologist is necessary. Most patients have to take hormone replacement medication. This will be discussed in detail, and you will receive prescriptions. You are discharged when you:

- have stable vital signs
- can walk on your own
- can eat and drink without becoming nauseous
- have normal control over your bladder
- have recovered normally from the anaesthetic.

As aspirin and anti-inflammatory pain relievers may increase the risk of bleeding of the operated site during healing, take these only on the advice of your surgeon.

RECOVERY AT HOME

- Paracetamol or paracetamol with codeine should provide good pain relief.
- Avoid blowing your nose, sneezing with the nose and mouth blocked, and underwater diving until cleared by your surgeon.
- Bleeding from the nose can occur, especially on exertion. Sit down and relax. Bleeding usually stops in a few minutes. If it persists or gets worse, go to your GP or nearest emergency department. Nasal packs may be needed to control the bleeding.
- Daily light exercise, home activities and walks help with recovery. Don't do too much too quickly. No heavy lifting.
- For at least one or two weeks after surgery, get assistance at home.
- Your surgeon can advise you about your return to work. It depends on your general recovery and occupation.

- You can drive when you feel well and vision is normal. If you had vision symptoms before surgery, ask your eye specialist whether you need to have further eye tests before you are allowed to drive.

Follow-up

You will see your neurosurgeon six to eight weeks after surgery, your endocrinologist four to six weeks after surgery (if you had a functioning tumour), and your eye specialist three to six weeks after surgery (if you had vision symptoms).

Medications for functioning tumours: After a functioning tumour has been removed, the aim of treatment is to return hormone levels to as close to normal as possible. Your endocrinologist will determine the doses of hormone replacement.

Non-functioning tumours: The surgeon will follow the patient's progress and schedule an MRI in the months after surgery to see if any tumour is still present.

Recurrence of a tumour: A tumour fragment that remains in the brain may regrow and cause a recurrence of symptoms. Depending on whether the tumour is functioning or non-functioning and the rate at which it is growing, further treatment to manage the tumour may include surgery, medications and/or radiotherapy.

The patient's endocrinologist or neurosurgeon may recommend that MRIs are taken at regular intervals (often yearly) to check on tumour regrowth, which may not occur for years.

Possible Complications of Pituitary Surgery

All surgical procedures are associated with some risk. Despite the highest standards of surgical practice, complications are possible.

It is not usual for a surgeon to dwell at length on every possible side effect or rare, but serious, complication of any procedure. However, it is important that you have enough information to weigh up the benefits, risks and limitations of pituitary surgery and related treatments. Most patients will not have complications. If you have concerns about possible side effects, discuss them with your surgeon.

Your surgeon cannot guarantee that treatment will meet all your expectations and that it has no risks. Although surgery may be successful, your surgeon cannot predict with certainty how the pituitary and nearby structures will recover.

The following list of possible complications is intended to inform you, not to alarm you. There may be others that are not listed.

General risks of surgery

- Infection of the operated site that requires treatment with antibiotics.
- Excessive bleeding; rarely, a blood transfusion may be needed.
- A blood clot that develops in a deep vein in a leg (deep venous thrombosis, DVT) may travel to the lungs, causing pulmonary embolism. DVT is not common but can be life threatening.
- Complications related to anaesthesia.
- Unforeseen complications, such as pneumonia, stroke or heart attack, may or may not be directly related to the surgery or anaesthesia.

Specific risks of pituitary surgery

- Bleeding can be excessive as the site of surgery is surrounded by many blood vessels and the nasal mucosa is very vascular. Internal carotid arteries run close to the pituitary and, uncommonly, can be injured during surgery, causing bleeding. Bleeding can put pressure on the optic nerve or optic chiasma and cause loss of vision. A return to theatre may be needed to manage bleeding and blood clots.
- The optic nerve, the eye and its muscles lie close to the area of surgery. Visual loss is a rare complication, as is temporary or prolonged double vision.
- In the event of major bleeding that cannot be controlled, the operation may have to be aborted, but this is rare.
- Death has occurred due to excessive bleeding, stroke, heart attack, infection (including meningitis) and other complications. The risk of death is about one or two patients in 100.
- Cerebrospinal fluid may leak from the operated site. Due to the abdominal fat graft placed in the surgical opening near the pituitary, the leak should stop quickly. If the leak does not resolve quickly, a return to theatre may be needed to stop it. If the leak is difficult to stop, the patient may require further treatment and have to stay in hospital until it stops. A lumbar drain (similar to an epidural catheter) may be required for a few days.
- Despite the surgeon's expertise and care, further damage to the pituitary gland may be caused by surgery in a very few cases. This may result in the need for lifetime hormone replacement.
- Damage to the pituitary can cause diabetes insipidus, which leads to constant thirst and a frequent need to urinate. This can be managed with medications. Permanent diabetes insipidus occurs in about eight patients in every 100.
- Chronic sinusitis of the sphenoid sinus. It is usually treated with antibiotics and can require some time to improve.
- Although the surgery may have been successful in removing the tumour, symptoms may not improve. Hormone levels may not return to normal. For patients with vision symptoms, eyesight may improve only slightly or not at all.
- Headaches may persist, but this usually resolves over time.
- Sodium in the blood may fall to low levels, causing the "syndrome of inappropriate anti-diuretic hormone" (SIADH), where the body is not excreting enough water through the urine. It can cause nausea, vomiting and seizures. To prevent this, your surgeon or endocrinologist may advise that you have a blood test for electrolytes and restrict the amount of fluids that you drink each day.
- Low cortisol levels in blood, which causes symptoms similar to SIADH. Be sure to take your hydrocortisone pills (if prescribed). Your endocrinologist will advise whether you need to take more.
- Scar-tissue adhesions of the mucus membrane within the nose. If the adhesions become especially annoying over time, they can be treated with minor surgery and local anaesthetic in the doctor's surgery.
- A perforation of the nasal septum (the midline partition of the nose) and smell abnormalities have been reported.

REPORT TO YOUR SURGEON

After surgery, contact your surgeon at once if you have any of these signs or symptoms:

- fever greater than 38°C or chills
- increasing pain in the nasal area
- persistent watery drainage, ooze or heavy bleeding from the nose
- pain, swelling or redness in one of your legs
- nausea and vomiting
- a severe headache, or
- if you have any questions or concerns.

Go immediately to the nearest hospital emergency department if you have sudden shortness of breath or chest pain.

Costs of Treatment

Your surgeon can advise you about coverage by public health insurance, private health insurance and out-of-pocket costs. You may want to ask for an estimate that lists the likely costs. Ask which costs can be claimed on health insurance. As the cost of actual treatment may differ from the proposed treatment, the final account may vary from the estimate. It is better to discuss costs with your surgeon before treatment rather than afterwards.

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