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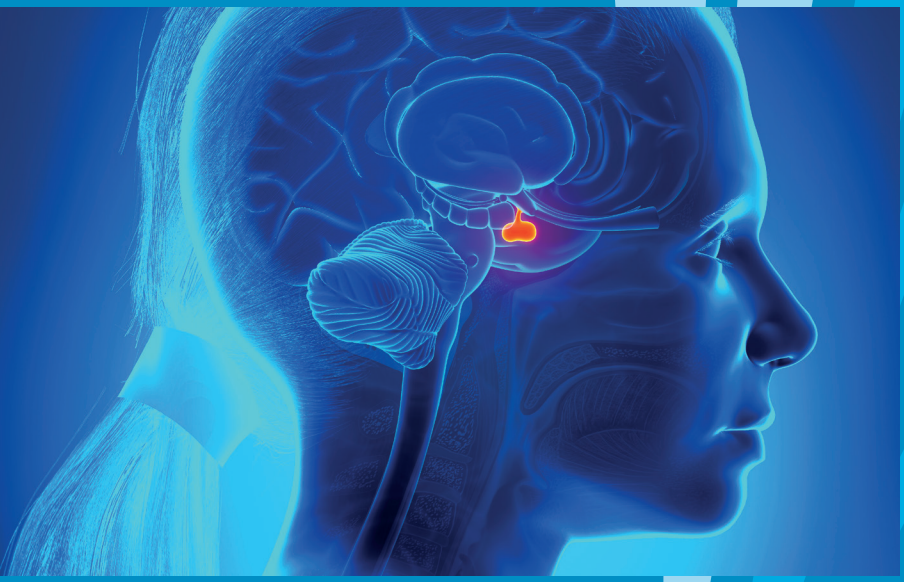


Pituitary surgery

patient information

WHAT IS THE PITUITARY GLAND OR HYPOPHYSIS?

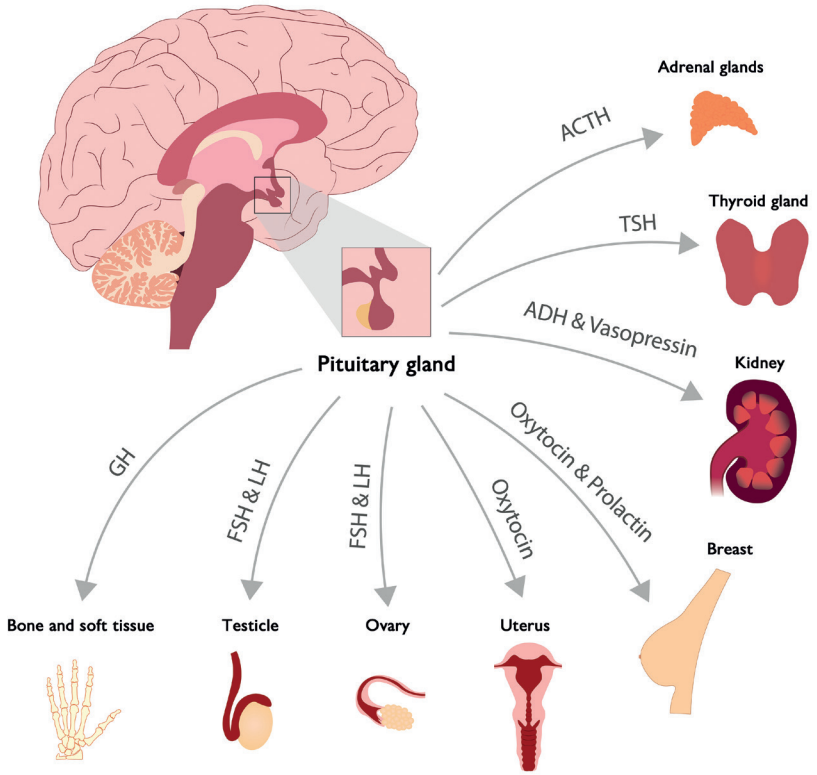
The pituitary gland is a small gland (approximately one centimetre in size) that plays a crucial role in regulating the hormones in our body. It is located centrally in your head, under your brains and is connected to your brains by a thin stalk. Major blood vessels that supply the brain with blood run on either side of the pituitary gland. Above it lies the crossing point of the optic nerves (the optic chiasm).

Location of the pituitary gland, centrally positioned within the skull

WHAT DOES THE PITUITARY GLAND DO?

The pituitary gland is a kind of control centre that regulates hormone production in the thyroid gland, adrenal glands and the ovaries or testicles. The pituitary gland also produces hormones that are essential for growth, bone formation, energy and water balance, fertility and breastfeeding. Some of these hormones are vital for survival.

The pituitary gland consists of an anterior and posterior lobe. The illustration below shows which hormones are produced by each lobe.



Pituitary gland with target organs and hormones.

PITUITARY DISORDERS

Pituitary disorders are relatively rare. Most are caused by a benign growth known as a pituitary adenoma.

PITUITARY ADENOMA

What is a pituitary adenoma?

In some individuals, a growth (tumour) develops in the pituitary gland. This is almost always benign and is referred to as a pituitary adenoma. In rare cases, it may result from a genetic condition involving a fault in the DNA. However, for most people, there is no explanation and no specific risk factors have been identified. A pituitary adenoma may occur in both men and women at any age.

How is a pituitary adenoma detected?

A pituitary adenoma may come to light in various ways:

- **Large pituitary adenoma** (>1 cm - macroadenoma):

A macroadenoma may cause complaints either due to excessive hormone production or by exerting pressure on surrounding structures. This can lead to:

→ Visual complaints

Pressure on the optic nerves may affect parts of the field of vision or reduce visual acuity. In rare cases, it can also result in double vision.

→ Hormonal deficiencies

Compression of healthy pituitary tissue may result in a reduced production of certain hormones. This is referred to as pituitary insufficiency.

→ Headache

A macroadenoma may cause a pressing headache, typically felt above the eyes.

→ Hormone overproduction

Some macroadenomas may produce hormones, resulting in excessive production of one specific hormone.

→ Apoplexy

Pituitary apoplexy is a sudden increase in the volume of a pituitary adenoma, caused by bleeding or a lack of oxygen in the tumour. This sudden increase in volume puts pressure on the structures surrounding the adenoma. This causes severe headache, a potential disruption of the hormone production in the normal pituitary gland and may also cause problems with your vision (such as a reduced field of vision, reduced visual acuity and double vision).

→ Incidental finding (incidentaloma)

Sometimes a macroadenoma is discovered by chance during a head scan performed for an unrelated reason.

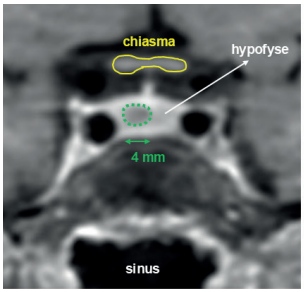
- **Small pituitary adenoma** (<1cm - microadenoma):

→ Hormone overproduction

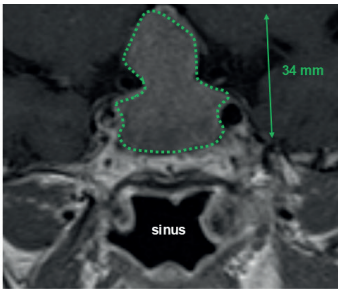
A microadenoma is usually detected due to complaints caused by excessive hormone production.

→ Incidental finding (incidentaloma)

Sometimes a microadenoma is discovered by chance during a head scan performed for an unrelated reason.



Microadenoma



Macroadenoma

MRI scans of pituitary adenomas.

How is a pituitary adenoma monitored or treated?

How a pituitary adenoma is treated or monitored depends on the size of the adenoma, the potential growth and its impact on your vision and/or hormone production.

Several treatment options are available:

→ Monitoring with MRI scans

If the pituitary adenoma does not affect hormone production and there is no contact with the optic nerves, treatment is usually not required. In such cases, the adenoma is monitored by regular MRI scans. Hormone production is tracked via blood samples.

→ Medication

- Adenoma with prolactin overproduction (hyperprolactinaemia)

  An adenoma that produces too much milk hormone (prolactin) is usually treated with medication. In some cases, surgery may still be advisable.

- Adenoma with overproduction of growth hormone (acromegaly):

  An adenoma that produces too much growth hormone is preferably treated surgically. If surgery is not possible, treatment with medication is also possible. In some patients, pre-treatment with medication is given before surgery. Post-operative medication may also be required in specific cases.

- Adenoma with overproduction of ACTH (Cushing's disease):
  An adenoma that produces too much ACTH is preferably removed surgically. If surgery is not possible, treatment with medication may be started. In some cases, medication is started prior to surgery.

- Adenoma without hormone production:
  An adenoma that does not produce hormones cannot be treated with medication.

→ Surgery

When is surgery for a pituitary adenoma advisable?

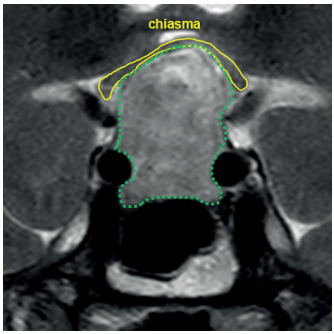
A surgical procedure may be necessary for various reasons. The decision is always made in consultation with you and depends on your specific situation.

The most common reasons for a procedure are:

- Contact with or pressure on the optic nerve
- Excessive hormone production
- Reduced hormone production
- A growing pituitary adenoma
- Apoplexy

1. Contact or pressure on the optic nerve

   If a pituitary adenoma comes into contact with or exerts pressure on the optic nerve, surgery is advisable. You may notice problems with your vision yourself, such as loss of part of your field of vision. An ophthalmologist can examine this. Visual acuity may also decrease, in one or both eyes. Without treatment, this can lead to blindness. The aim of surgery is to prevent a further deterioration of your vision. The likelihood of recovery of your vision depends on how long the symptoms have been present.



MRI image of a macroadenoma pressing on the optic chiasm.

2. Excessive hormone production

   - Excessive ACTH production (Cushing's disease)

     If the pituitary gland produces too much ACTH, the adrenal glands are stimulated to produce excessive cortisol. This can lead to health issues such as high blood pressure, weight gain, (pre)diabetes, loss of muscle mass and strength, osteoporosis, etc. Your face may appear swollen and you may bruise more easily. Some patients live with these symptoms for years before a hormonal problem is considered Diagnosing a pituitary adenoma as the source of ACTH

and cortisol overproduction is not straightforward, as the adenoma is often very small (just a few millimetres) and may not be visible on MRI. The endocrinologist will therefore carry out several tests. If these confirm that the problem lies in the pituitary gland, surgery will be recommended. Pre- and/or post-operative treatment with medication may be necessary.

- Excessive growth hormone production (acromegaly)
  A pituitary adenoma that produces too much growth hormone can lead to enlarged hands, feet, nose, jaw or cheekbones, tingling in the hands, aching joint and headaches, excessive sweating and fluid retention. Internal organs such as the heart, liver or thyroid gland may also enlarge. Additional complaints may include (pre)diabetes or sleep apnoea (obstructive sleep apnoea syndrome, OSAS). As with Cushing's disease, finding a diagnosis may take time

  A pituitary adenoma that produces excessive growth hormone is treated surgically in most patients. Pre- and/or post-operative treatment with medication may be necessary.

- Excessive prolactin production
  Elevated prolactin levels can cause nipple discharge (milk or fluid), irregular menstrual cycles or absence of menstruation in women. Ovulation may also be suppressed. In men, it may lead to reduced testosterone and sperm production. There are various causes of raised prolactin levels in the blood, one of which is a pituitary adenoma. This type of adenoma is usually treated with medication, although surgery may be necessary in some cases.

- Excessive TSH or LH/FSH production

  It is very rare for a pituitary adenoma to produce excessive TSH. Overproduction of TSH can result in hyperthyroidism (overactive thyroid) and is treated with medication or surgery.

  An adenoma that produces excessive LH/FSH usually does not cause complaints related to hormone overproduction.

3. Reduced hormone production in the pituitary gland

   A large pituitary adenoma or a Rathke's cleft cyst (RCC, see p.13) may compress normal pituitary tissue, leading to reduced hormone production. This may be a reason to consider surgery. The decision depends on the severity of the hormonal disorder, which hormones are affected and the characteristics of the adenoma.

4. Enlargement of the pituitary adenoma

   A pituitary adenoma that does not affect hormone production or vision does not always require surgery. If surgery is not performed, the adenoma is monitored with MRI scans. If the adenoma increases in size, surgery may be advisable to prevent problems involving the optic nerves or normal pituitary gland.

5. Apoplexy

   Pituitary apoplexy is a sudden increase in the volume of a pituitary adenoma, caused by bleeding or a lack of oxygen in the tumour. This sudden increase in volume puts pressure on the structures surrounding the adenoma. The most typical complaints include sudden, severe headache, problems with your vision (such as double vision, reduced field of vision or reduced visual acuity) and reduced hormone production. An apoplexy

may also occur with mild symptoms or no noticeable symptoms. If imaging during follow-up of a pituitary adenoma shows signs of apoplexy, this will be monitored further. Surgery is required if the bleeding causes symptoms or recurs.

Other pituitary gland disorders

In addition to pituitary adenomas, other disorders may occur near the pituitary gland. These may be visible on a scan and may cause symptoms, such as hormonal problems or pressure on the optic nerves.

→ Rathke's cleft cyst (RCC)

A cyst is a fluid-filled cavity. In some people, a cyst may form between the anterior and posterior lobes of the pituitary gland which is known as a Rathke's cleft cyst (RCC). A small cyst usually causes no complaints and does not require treatment. A larger cyst may disrupt hormone production in the pituitary gland or exert pressure on the optic nerves. In such cases, surgical removal of the cyst may be necessary. Clear growth of an RCC during follow-up may also warrant surgery to prevent problems with the pituitary gland or optic nerves.

→ Craniopharyngioma

A craniopharyngioma is a rare, slow-growing but benign tumour that develops near the pituitary gland. On imaging, a craniopharyngioma is usually easy to distinguish from a pituitary adenoma. Craniopharyngiomas can be large and located mostly above the pituitary gland, though in some cases they are small and situated within the pituitary gland.

→ Meningioma

A meningioma is a benign growth that originates from the meninges. Meningiomas are relatively common growths. Because the meninges line the inside of your skull, meningiomas may develop near the pituitary gland in rare cases. This may cause problems with your vision or reduced hormone production. On imaging, a meningioma may sometimes look like a pituitary adenoma.

→ Inflammation of the pituitary gland

Inflammation of the pituitary gland (hypophysitis) is very rare and usually leads to reduced pituitary function. It may occasionally occur in patients with a Rathke's cleft cyst.

→ Malignant tumour

A malignant tumour of the pituitary gland is extremely rare. It may be a primary tumour originating in the pituitary gland (pituitary carcinoma) or a metastasis from a tumour elsewhere in the body.

WHAT IS THE AIM OF SURGERY?

The aim of surgery is to completely remove the pituitary adenoma, provided this can be done safely. The neurosurgeon will attempt to avoid damaging surrounding structures (blood vessels, nerves, brain tissue) and the normal pituitary gland.

If it is already clear before the procedure that full removal of the adenoma is not possible, surgery may still be necessary to partially remove the tumour. This may be to relieve (or prevent) pressure on the optic nerves or in case of hormone overproduction. The part of the adenoma that could not be removed will be monitored through regular MRI scans. If hormone overproduction persists, additional treatment with medication may be required. In rare cases, supplementary radiotherapy may be suggested.

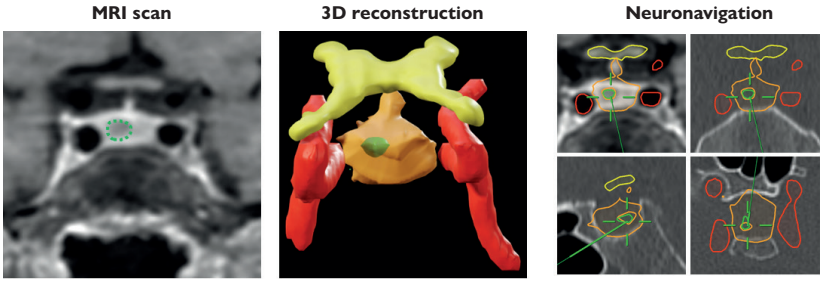
HOW IS THE SURGERY PERFORMED?

The procedure is carried out under general anaesthesia using a camera (endoscope) and surgical instruments inserted through both nostrils. It is performed by a specialised team consisting of ENT (ear, nose and throat) surgeons and neurosurgeons. They operate through the air-filled spaces in the nose (sinuses) without making any external incisions.

In the operating theatre.

The pituitary gland lies against the sphenoidal sinus, separated by a thin piece of skull bone approximately one millimetre thick. This piece of bone needs to be removed during surgery to access the pituitary gland. This procedure is known as an endoscopic transsphenoidal removal of a pituitary adenoma. Surgery takes approximately two hours.

A neuronavigation system is used during the procedure. Prior to surgery, a CT and MRI scans are performed and the images are combined. These scans are used to create a virtual surgical plan using 3D reconstructions. The neuronavigation system allows surgeons to determine their exact position relative to the pituitary gland and surrounding structures throughout surgery. This increases both the precision and safety of the procedure.



Neuronavigation. Based on the MRI scan, a 3D reconstruction is made showing the position of the pituitary adenoma (green) in relation to the surrounding structures (yellow for the optic nerves and chiasm, orange for the normal pituitary gland and red for the carotid artery). This MRI scan is then integrated into the CT scan that was made prior to surgery. This information is then used during the procedure. An instrument (a green line and cross) allows the surgeons to precisely determine their location throughout the operation.

At the end of the procedure, the opening in the bone is carefully sealed using a combination of a small sponge and a specialised tissue adhesive. In every operation, there is also the option to remove a small piece of fatty tissue around the navel. This tissue may be needed to reinforce the closure or in cases involving cerebrospinal fluid (see complications). If required, a small incision is made just below the navel to remove the fatty tissue. The location of the incision depends on any previous scars or surgeries.

WHAT ARE POSSIBLE SIDE-EFFECTS OF THE OPERATION?

Every operation comes with risks. Surgery will only be recommended if the medical team is confident that the benefits of the operation outweigh the risks and possible side-effects.

Possible side-effects include:

- **Discomfort due to nasal access**

  In the first few weeks following surgery, it will often feel as though your nose is blocked. This is caused by irritation of the nasal mucosa, which will swell like when you have a cold. You will be given nose drops for this. Regular nasal rinsing is also advisable to prevent the mucosa from drying out. This is started shortly after the procedure. Swelling may also temporarily reduce your sense of smell, which usually improves within a few weeks. Long-term effects on the sense of smell are rare.

  In the first few hours after surgery, you may bleed from your nose. This can usually be stopped by placing a type of sponge in the nose. If bleeding persists and cannot be managed this way, a further procedure may be required in rare cases to stop the bleeding.

- **Reduced function of the normal pituitary gland**

  As a result of the surgery and manipulation of the normal pituitary gland, its function may be temporarily reduced. For this reason, you will routinely be administered the stress hormone hydrocortisone during the operative period. In the days following surgery, several blood tests will show whether the pituitary gland is functioning normally and whether additional medication is required. You will be admitted to the endocrinology ward for this.

  One of the hormones produced by the pituitary gland is the antidiuretic hormone (ADH). This regulates the body's water and salt balance by helping you retain water and urinate less. If this hormone is no longer produced, you will urinate excessively and feel the need to hydrate. This deficiency is known as diabetes insipidus or AVP deficiency. If this occurs, the hormone will be administered via a catheter or tablets.

  Even after successful surgery, your hormone balance may be disrupted which means you may require additional medication. In most cases, the hormone function recovers within a few days to weeks. The likelihood of a permanent deficiency in pituitary hormones after surgery is low (<5%.).

- **Leakage of cerebrospinal fluid**

  The brain is surrounded by fluid known as cerebrospinal fluid (CSF). The brain is surrounded by meninges, which ensure that the fluid remains around the brain. The pituitary gland is located at the base of the brain and is separated from the CSF space by a membrane. This means that, in principle, surgery on the pituitary gland can be performed without causing CSF leakage.

In cases of large tumours that have stretched the membrane or adhered to it, a CSF leak may occur during surgery. If this happens, the surgery can continue, provided the leak is sealed at the end of the procedure. This is usually done by using fatty tissue taken via a small incision near the navel, combined with surgical glue.

Sometimes a CSF leak only occurs in the days following surgery. The likelihood of this is low (<5%). If it does happen, additional treatment is required. One possibility is to insert a small tube into the lower back (via a lumbar puncture) to drain the CSF. This reduces pressure in the head and allows the leak to close naturally. The tube usually remains in place for five days. Sometimes a second surgical procedure is needed to seal the leak. A combination of both treatments (drainage and second operation) is also possible. CSF leakage after discharge from hospital is rare.

- **Infection**

Although the procedure is performed through the nose, the risk of infection is low. In the days following surgery, you will be given preventive antibiotics to reduce the chances of infection. Particularly in case of prolonged cerebrospinal fluid (CSF) leakage, for instance at home, there is a risk of infection. In case of CSF leakage, bacteria may enter and cause meningitis.
If meningitis occurs, treatment with intravenous antibiotics is required, usually for two weeks. Meningitis is a rare complication after pituitary surgery.

- **Bleeding**

  The pituitary gland lies between two major arteries that supply oxygenated blood to the brain, i.e. the left and right internal carotid arteries. The most serious side-effect of the surgical removal of a pituitary adenoma is damage to these blood vessels, which can result in severe bleeding. Such bleeding may be life-threatening. However, thanks to neuronavigation technology, the risk is very low (estimated at 0.4%).

- **Damage to other surrounding structures**

  The risk of damage to brain structures during surgery is very low. A reduction in eyesight due to manipulation of the optic nerves is rare. In rare cases, double vision may occur after the operation. This is caused by manipulation of the nerves that control the eye muscles. In most cases, this resolves itself spontaneously within a few days to months following the procedure.

- **Risk of thrombosis and pulmonary embolism**

  As with any operation, there is a small risk of blood clot formation in the legs (deep vein thrombosis) or lungs (pulmonary embolism). This risk is reduced through early mobilisation and the use of preventive blood thinners after surgery.

HOSPITAL ADMISSION PROCEDURE

You are usually admitted to hospital the day before surgery, typically in the afternoon. On admission, a quick brain scan (approximately 30 seconds) is performed for the use of neuronavigation during the procedure. If you are admitted on the day of surgery, the scan will be performed either when you're admitted or a few days beforehand.

Storage space at the unit is quite limited. Please only bring essential items and leave valuables at home.

You should bring the following to the hospital:

- ✔ All medication you are currently taking in the original packaging. Give this medication to the nursing staff who will look after it for you.
- ✔ Pyjamas and dressing gown
- ✔ Sturdy, closed slippers or trainers
- ✔ Toiletries, towels and flannels
- ✔ Razor
- ✔ Books and/or magazines
- ✔ Charger for your mobile
- ✔ Insurance certificate

Preparation for the operation:

- ✔ Ideally, moustaches and beards should be shaved prior to surgery. You may do this yourself at home in the days leading up to surgery.
- ✔ You may drink water up to two hours before surgery. Any medication may be taken with a small sip of water.
- ✔ From midnight onwards, you need to fast. No solid food is allowed.

Immediately before surgery:

- ✔ Remove jewellery and piercings, glasses, contact lenses, make-up, dentures, hearing aids and possible wig and store these items safely in the wardrobe in your room. Give the key to the nurse.
- ✔ You will be given a surgical gown.
- ✔ The nurse will check if you have an identification bracelet around your wrist.
- ✔ The nurse will tell you which medication you may take before the operation (with a small sip of water).
- ✔ You are taken to the operating theatre.

Day of surgery

The procedure is carried out under general anaesthesia. You may not eat anything from midnight on the day before surgery. On the morning of the surgery and possibly in the afternoon, you may take your prescribed medication with a small sip of water. You may also drink water up to two hours before the procedure. While you are under anaesthesia, a urinary catheter will be inserted via the urethra. This is necessary to monitor how much urine you produce, as you will need to remain in bed during the first evening and night after surgery.

Following surgery you will be woken up in the operating theatre and transferred to an intensive care unit. If you can be *fast tracked*, you may return to the general ward on the evening of the procedure. Otherwise, you will stay overnight in the intensive care unit and be transferred to the general ward around noon the following day. From that point, you may sit upright in bed and eat and drink like before the surgery. If this goes well, you may get out of bed, walk around your room and use the bathroom. A nurse will assist you.

The wound in your nose will be treated with nasal sprays (to reduce swelling of the mucosa) and nasal rinses. The nurse will explain how to use them. It is important to do so correctly. You may not blow your nose and should try to sneeze with your mouth open. The sensation is similar to having a blocked nose when you have a cold. You may also have a frontal headache. For the first few weeks after surgery, your sense of smell may be reduced or absent.

In the first few days following surgery, we will monitor the hormone production of the normal pituitary gland. Daily blood tests and urine analyses will be carried out.

- **ADH hormone:** The release of ADH hormone may be disrupted by the surgery. This hormone is vital for survival. A deficiency can lead to excessive urination and increased thirst. While you are in hospital, the nursing staff will monitor your fluid intake and output. We will also measure the sodium level in your blood and the concentration of dissolved substances in your urine on a daily basis. If there is an ADH deficiency, you will receive replacement medication. For most patients, this is only necessary for a short period after surgery, but in some cases the deficiency may persist.

- **Cortisol hormone:** Your blood cortisol level will be measured daily. This hormone is also vital for survival, as it helps regulate blood pressure and energy levels. A deficiency can result in low blood pressure, dizziness and reduced consciousness. In the first few days after surgery, you will receive hydrocortisone (cortisol) either via intravenous infusion or in tablet form. If your cortisol production is sufficient, this medication will be discontinued. If production remains inadequate, you will need to continue taking tablets at home. Patients with Cushing's disease will need to continue hydrocortisone treatment for several weeks following surgery.

- **Other hormone measurements** depend on your specific situation.

WHAT AFTER DISCHARGE FROM HOSPITAL?

When you are discharged from hospital, your doctor will go through a medication overview with you. You must continue using the nasal spray at home (twice daily for one month). Nasal rinsing should also be continued for one month after the operation.

During the first ten days following surgery, limit your fluid intake to a maximum of one to one-and-a-half litres per day to avoid disrupting your body's salt balance. If you experience extreme thirst or urinate excessively, you may drink more, but contact the hospital immediately. .

Allow your body time to recover during the first few weeks after surgery. Pituitary surgery can cause significant fluctuations in hormone levels. It may take several months to reach a new hormonal balance.

WHAT ARE THE WARNING SIGNS FOLLOWING SURGERY?

There are several important warning signs to watch out for following surgery. If you notice any of the following symptoms, contact the hospital immediately or go to the emergency department.

a. Fever

A fever may indicate an infection and should be examined by a doctor.

b. Clear fluid from the nose (not related to rinsing)

This may indicate a leakage of cerebrospinal fluid (CSF) and must be checked in hospital. In case of doubt, the discharged fluid may be collected and sent for analysis to confirm whether it is indeed CSF. Contact the hospital immediately, as this condition can lead to meningitis if it persists.

c. Severe nosebleed

During recovery, the nasal mucosa is fragile. It is therefore not unusual for a small nosebleed to occur. However, if the bleeding is recurrent or heavy, contact the hospital immediately.

d. Vomiting, confusion, reduced consciousness

Severe nausea and vomiting may indicate a disrupted ADH hormone balance, where the pituitary gland releases too much ADH into the body. This can disturb the body's fluid and salt balance. In rare cases, it may also lead to confusion and reduced consciousness. If you notice any

of these symptoms, go to the emergency department immediately.

e. Extreme thirst

If the pituitary gland releases too little ADH hormone, this can disturb the body's fluid and salt balance. You will be very thirsty and need to urinate frequently. It is important to drink when you feel thirsty. If you are urinating a lot (more than three litres per day) or have to get up several times at night to urinate, contact the hospital.

FOLLOW-UP AFTER SURGERY

When you leave the hospital, you will be given the date of your first follow-up appointment. The endocrinology consultation is usually scheduled two to four weeks after your discharge. This term may vary depending on your specific problem, how the operation went and your recovery over the first few days.

An ENT specialist will also schedule an appointment to monitor the healing of the wound inside your nose.

A follow-up MRI scan is scheduled three to six months after the procedure, usually just before your follow-up appointment with the neurosurgeon.

If the pituitary adenoma affected your vision, a follow-up appointment with an ophthalmologist will also be scheduled. This appointment can be with your own ophthalmologist, provided a report is sent to the treating neurosurgeon. Ideally, this examination should take place before your follow-up appointment with the neurosurgeon.

PITUITARY CARE AT UZ LEUVEN

During your treatment, you will come into contact with various healthcare professionals. While you are in hospital, you will see doctors and nurses with experience treating patients with pituitary conditions. Several specialists are involved in your care. You may meet some of them personally, while others play an important role behind the scenes:

- Endocrinologist
- Neurosurgeon
- Ear, Nose and Throat (ENT) and Head & Neck Surgeon
- Radiologist
- Ophthalmologist
- Anatomist-pathologist
- Anaesthetist
- Intensive care specialist
- Laboratory medicine specialist

TRAINING OF YOUNG DOCTORS AT UZ LEUVEN

UZ Leuven is a university hospital where young doctors and nurses are trained. During your admission and consultations, you will also be seen by physician-specialists in training. These young doctors have graduated as physicians and are receiving further training to become specialists. They always work under the supervision of a physician-specialist with specific experience in pituitary disorders, surgeries and potential post-operative problems.

RESEARCH AT UZ LEUVEN

As a university hospital, UZ Leuven conducts research to improve care for patients with pituitary conditions. You may therefore be invited to participate in our scientific research. Participation is always voluntary.

FREQUENTLY ASKED QUESTIONS

What if I take blood-thinning medication?

If you take blood-thinning medication (e.g. Asaflow, Xarelto, Pradaxa, Eliquis, Lixiana, Plavix, Clopidogrel, Marcoumar, etc.), you will need to stop taking it before the operation. The surgeon and anaesthetist will discuss with you when to do so. You can usually resume this medication two weeks after the operation. Depending on your specific situation, this period may be shorter or longer. If you started any new medication between your last consultation and the procedure, always inform your doctor.

How long should I take preventive blood thinners?

Most patients only receive preventive blood thinners during their hospital stay. Patients with Cushing's disease have an increased risk of thrombosis, which means they need to continue taking this medication for one month after surgery.

Can I blow my nose after surgery?

No, you should not blow your nose for the first few weeks after surgery. Doing so may interfere with wound healing and increase the risk of side-effects, such as a cerebrospinal fluid (CSF) leak. Instead, use nasal rinses.

I am a CPAP patient. How long should I stop using it?

To prevent the nasal mucosa from drying out, it is recommended that you do not use CPAP for two weeks. This period may be extended depending on whether there is any CSF leakage. If we believe a longer period is necessary, this will be discussed with you before you are discharged from hospital.

How often do I need follow-up appointments following surgery?

The frequency of follow-up appointments depends on your recovery and the need to monitor hormonal function. The first follow-up appointment is usually scheduled within two to four weeks after discharge, followed by further appointments in the longer term.

Can the tumour come back?

Although surgery aims to remove the tumour completely, there is a chance it may return. That's why regular follow-up appointments with imaging (MRI), blood tests and urine collections are necessary.

How will I know if my hormone levels are back to normal?

Your endocrinologist will monitor your hormone levels through blood and urine tests. It may take time for your hormones to stabilise. Long-term or lifelong medication may be required.

Are there any lasting limitations following surgery?

Most patients are able to resume their normal lives once fully recovered. In some cases, medication is needed to suppress ongoing hormone overproduction, depending on the outcome of the surgery.

Can I still have children after pituitary surgery?

The pituitary gland plays an important role in producing hormones essential for fertility. These hormones regulate ovulation in women and support normal testosterone and sperm production in men.

A pituitary tumour may affect the gland's ability to produce these hormones adequately. In such cases, medication may be needed to restore normal ovulation or sperm production.

For women, it's possible to become pregnant after pituitary surgery. However, it may be necessary to adjust the medication or perform a new MRI scan first.

If you wish to have children, your hormone specialist will discuss this with you in detail.

How long will I be off work?

You will be unable to work for four to six weeks following the procedure. This period may be longer depending on the nature of your job and how the surgery and your recovery progress.

Can I travel by plane?

You should not fly during the first four weeks following surgery.

Can I go swimming or visit the sauna?

Swimming and sauna visits should be avoided during the first four weeks following surgery.

When can I drive my car again?

It's best not to drive during the first four weeks following the procedure.

Can I exercise, have sex, do DIY or work in the garden?

We recommend taking it easy for the first two to four weeks following surgery. During this time, avoid lifting, carrying or any strenuous activity. When it's hot out, it’s best to stay indoors in a cool environment. When you've been discharged from hospital, you may resume gentle activities such as walking or cycling. Start with short distances and if you feel well and experience no discomfort, you can gradually increase them.

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NOTES

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