About Pituitary Tumors

Overview and Types

If you have been diagnosed with a pituitary tumor or worried about it, you likely have a lot of questions. Learning some basics is a good place to start.

- **What Are Pituitary Tumors?**

Research and Statistics

See the latest estimates for new cases of pituitary tumors in the US and what research is currently being done.

- **What Are the Key Statistics About Pituitary Tumors?**
- **What’s New in Pituitary Tumor Research and Treatment?**

What Are Pituitary Tumors?

A tumor is an abnormal growth of cells. Tumors can start nearly anywhere in the body. Tumors that start in the pituitary gland are called *pituitary tumors*.

To understand pituitary tumors, it helps to know about the normal pituitary gland and what it does.

The pituitary gland

The pituitary is a small gland found inside the skull just below the brain and above the nasal passages, which are above the fleshy back part of the roof of the mouth (known as the *soft palate*). The pituitary sits in a tiny bony space called the *sella turcica*. The nerves that connect the eyes to the brain, called the *optic nerves*, pass close by it.
The pituitary gland is connected directly to part of the brain called the hypothalamus. This provides a key link between the brain and the endocrine system, a collection of glands in the body that make hormones. Hormones are substances released into the blood that control how other organs work. The hypothalamus releases hormones into tiny blood vessels directly connected to the pituitary gland. These cause the pituitary gland to make its own hormones. The pituitary is considered the “master control gland” because the hormones it makes control the levels of hormones made by most other endocrine glands in the body.

The pituitary gland has 2 parts, the anterior pituitary and the posterior pituitary, each of which has distinct functions.

**Anterior pituitary**

Most pituitary tumors begin in the larger, front part of the pituitary gland known as the anterior pituitary. This part of the gland makes several hormones that control other endocrine glands.
• **Growth hormone** (GH, also known as somatotropin) promotes body growth during childhood. If too much is made in a child they will grow very tall. Normally, adults make only small amounts of growth hormone. If an adult makes too much growth hormone, the bones of the hands, feet, and face continue to grow and become quite large, causing their normal features to become distorted. This condition is called **acromegaly**.

• **Thyroid-stimulating hormone** (TSH, also called thyrotropin) stimulates growth of the thyroid gland and the release of thyroid hormone. Thyroid hormone regulates metabolism. Too much makes you hyperactive and shaky, and too little makes you sluggish. If a pituitary tumor makes too much TSH, it can cause hyperthyroidism (an overactive thyroid gland).

• **Adrenocorticotropic hormone** (ACTH, also known as corticotropin) causes the adrenal glands to grow and to make steroid hormones (such as cortisol). Too much ACTH from the pituitary causes Cushing’s disease, the symptoms of which can include rapid weight gain and the buildup of fat in certain parts of the body.

• **Luteinizing hormone (LH)** and **follicle-stimulating hormone (FSH)** are also called **gonadotropins**. In women their main effects are on the ovaries, where they regulate ovulation (the release of eggs) and the production of the hormones estrogen and progesterone. In men, LH and FSH control testosterone and sperm production in the testicles.

• **Prolactin** causes milk production in the female breast. Its function in men is not known.

**Posterior pituitary**

The smaller, back part of the pituitary gland, known as the posterior pituitary, is really an extension of brain tissue from the hypothalamus. The posterior pituitary is where hormones made by the hypothalamus (vasopressin and oxytocin) are stored and released into the bloodstream.

• **Vasopressin** (also called antidiuretic hormone, or ADH) causes the kidneys to keep water in the body and not lose it all in the urine. Without vasopressin, a person urinates too much and becomes dehydrated. This condition is called diabetes insipidus. Vasopressin also can raise blood pressure by causing blood vessels to constrict. It might have other functions as well.

• **Oxytocin** causes the uterus to contract in women during childbirth and the breasts to release milk when a woman nurses her baby. It might have other functions in both men and women as well.
Tumors rarely develop in the posterior pituitary.

**Pituitary tumors**

Almost all pituitary tumors are benign (non-cancerous) glandular tumors called *pituitary adenomas*. These tumors are considered benign because they don’t spread to other parts of the body, like cancers can do. Still, even benign pituitary tumors can cause significant health problems because of their location near the brain and because many of them secrete excess hormones.

Pituitary cancers (called *pituitary carcinomas*) are very rare.

**Pituitary adenomas**

These benign tumors do not spread outside the skull. They usually remain confined to the sella turcica (the tiny space in the skull that the pituitary gland sits in). Sometimes they grow into the walls of the sella turcica and surrounding blood vessels, nerves, and coverings of the brain. They don’t grow very large, but they can have a big impact on a person’s health.

There is very little room for tumors to grow in this part of the skull. Therefore, if the tumor becomes larger than about a centimeter (about half an inch) across, it may grow upward, where it can compress and damage nearby parts of the brain and the nerves that arise from it. This can lead to symptoms such as vision changes or headaches. (See **Signs and Symptoms of Pituitary Tumors**.)

**Microadenoma versus macroadenoma**

Pituitary adenomas can be divided into 2 categories based on size:

- **Microadenomas** are tumors that are smaller than 1 centimeter (cm) across. Because these tumors are small, they rarely damage the rest of the pituitary or nearby tissues. But they can cause symptoms if they make too much of a certain hormone. Many people actually have small adenomas that are never detected because they never grow large enough or secrete enough hormones to cause a problem.

- **Macroadenomas** are tumors 1 cm across or larger. Macroadenomas can affect a person’s health in 2 ways. First, they can cause symptoms if they make too much of a certain hormone. Second, they can cause symptoms by pressing on normal parts
of the pituitary or on nearby nerves, such as the optic nerves.

**Functional versus non-functional adenoma**

Pituitary adenomas are also classified by whether they make too much of a hormone and, if they do, which type they make. If a pituitary adenoma makes too much of a hormone it is called *functional*. If it doesn’t make enough hormones to cause problems it is called *non-functional*.

**Functional adenomas:** Most of the pituitary adenomas that are found make excess hormones. The hormones can be detected by blood tests or by tests of the tumor when it is removed with surgery. Based on these results, adenomas are classified as:

- Prolactin-producing adenomas (prolactinomas), which account for about 4 out of 10 pituitary tumors
- Growth hormone-secreting adenomas, which make up about 2 in 10 pituitary tumors
- Corticotropin (ACTH)-secreting adenomas (about 5% to 10%)
- Gonadotropin (LH and FSH)-secreting adenomas (less than 1%)
- Thyrotropin (TSH)-secreting adenomas (less than 1%)

Some adenomas secrete more than one type of hormone.

The kind of hormone an adenoma produces strongly affects what signs and symptoms the patient has. It also affects which tests are used for diagnosis, the choice of treatment, and the patient’s outlook.

**Non-functional adenomas:** Pituitary adenomas that don’t make excess hormones are called *non-functional adenomas* or *null cell adenomas*. They account for about 3 in 10 of all pituitary tumors that are found. They are usually detected as macroadenomas, causing symptoms because of their size as they press on surrounding structures.

**Pituitary carcinomas**

Cancers of the pituitary gland are rare. Only a few hundred have ever been described in medical journals. They can occur at any age, but most are found in older people. These cancers usually make hormones, just like many adenomas do.

Most pituitary carcinomas look very much like pituitary adenomas under a microscope, so doctors have trouble telling them apart. In fact, there is no good way to tell if a pituitary tumor is a carcinoma and not an adenoma until the tumor spreads to another part of the body. If this happens, it is typically 5 to 10 years after the first surgery. Most
often it spreads to the brain, spinal cord, meninges (the covering of the brain and spinal cord), or bone around the pituitary. Rarely, these cancers spread to other organs such as the liver, heart, or lungs.

Other tumors of the pituitary region

There are several other types of benign tumors that grow in the region of the pituitary, as well as some malignant (cancerous) ones. All are much less common than pituitary adenomas.

Teratomas, germinomas, and choriocarcinomas are all rare tumors that usually occur in children or young adults. They don’t develop from the hormone-making cells of the pituitary gland itself, but they can grow into the pituitary and damage it.

Rathke cleft cysts and gangliocytomas of the pituitary are rare tumors that are usually found in adults.

Craniopharyngiomas are slow-growing tumors that start above the pituitary gland but below the brain itself. They sometimes press on the pituitary and the hypothalamus, causing hormonal problems. They are more common in children, but they are sometimes seen in older adults. For more on these tumors, see Brain and Spinal Cord Tumors in Children.

Cancers that start in some other parts of the body (like the breast) can sometimes spread to the pituitary. These cancers are classified and treated based on where they started (their primary site) and are not thought of as pituitary tumors.

The rest of this document focuses mainly on benign pituitary tumors (pituitary adenomas).

- References

See all references for Pituitary Tumors

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What Are the Key Statistics About Pituitary Tumors?

About 10,000 pituitary tumors are diagnosed each year in the United States. Almost all of these tumors are benign pituitary adenomas. Very few pituitary tumors are cancers (carcinomas).

The actual number of pituitary tumors may be much higher than the number of tumors that are found each year. When examining people who have died or who have had imaging tests (like MRI scans) of their brain for other health problems, doctors have found that as many as 1 out of 4 people may have a pituitary adenoma without knowing it. These tumors are often small and never cause any symptoms or health problems, so very few of them would normally be diagnosed at all.

Pituitary tumors can occur at any age (including in children), but they are most often found in older adults.

- References
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What’s New in Pituitary Tumor Research and Treatment?

Research into pituitary tumors is taking place in many university hospitals, medical centers, and other institutions around the world.

Doctors now have a better understanding of the genetic basis of pituitary tumors. This is already leading to improvements in genetic testing for people who are suspected of having multiple endocrine neoplasia, type I (MEN1) or other syndromes. This work is also shedding light on the characteristics of non-functioning adenomas, which may lead...
to new medical therapies for these tumors.

Imaging tests such as MRI scans continue to improve, leading to better accuracy in finding and determining the extent of new and recurrent tumors.

Surgical techniques are improving, allowing doctors to remove tumors with fewer complications than ever before. Radiation therapy techniques are improving as well, letting doctors focus radiation more precisely on tumors and limiting the damage to nearby normal tissues.

Progress is also being made in the medicines used to treat both pituitary tumors and the side effects of some other forms of treatment. For example, growth hormone is now produced by DNA technology and has been approved for treating adults who don’t make enough growth hormone after treatment for a pituitary tumor.

Doctors are looking to see if combining some of the drugs used to treat pituitary tumors (at lower doses) might work better than using a single drug for some types of tumors. Researchers are also studying some newer drugs. An example is lapatinib (Tykerb), a drug that targets a protein called HER2, which is found in large amounts on some fast-growing cells (including some pituitary tumor cells). This drug is already used to treat breast cancer, and it is now being studied for use against pituitary tumors.

Other drugs are now being studied in clinical trials as well.

- References
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