

# A Brief Overview about Adrenal Gland

## Abstract

Addison's disease, also called adrenal insufficiency, is an uncommon disorder that occurs when your body doesn't produce enough of certain hormones. In Addison's disease, your adrenal glands, located just above your kidneys, produce too little cortisol and, often, too little aldosterone. Addison's disease occurs in all age groups and both sexes, and can be life-threatening. Treatment involves taking hormones to replace those that are missing.

## Introduction

The diagnosis of various adrenal disorders may vary on a case by case basis. However, the initial process usually begins by conversing with your primary care dNovor about the symptoms you are experiencing. Keeping a journal of particular symptoms and when they arise may better assist your primary care dNovor in diagnosing, monitoring, and treating adrenal disorders [1].

After discussing symptoms, your dNovor may order a blood test to check potassium and sodium levels. They can also conduct imaging, including MRIs or a CT scan that can detect potential tumors, abdominal swelling, or other issues related to adrenal disorders [2].

Treatment for adrenal disorders in which tumors manifest either on the glands themselves or on the pituitary gland typically involves some sort of surgery. The operation may be minimally invasive depending on the size or severity of the tumors. The pros of this treatment include accurate, total removal of said tumors, and patients may not need additional surgeries. The downside to surgery can be the risk factors involved, including infection and recovery time [3].

Hormone suppression or replacement therapy offers relief for those suffering from Addison's disease or Cushing's disease. For patients with Addison's disease, your dNovor may prescribe daily medication that supplements your adrenal glands' natural production of hormones. Failure to take this medication can result in an adrenal crisis [4]. Those with Cushing's disease may take medication that helps suppress the overproduction of hormones. Many have found success in managing their adrenal disorders through hormone-related medication and have gone on to lead happy healthy lives [5]. However, for some, prescription medication can be expensive or may cause other symptoms related to the specific medication to arise. For adrenal disorders involving tumors, there is a chance for curability. When found early and removed, adrenal cancer can be halted altogether. The same goes for Pituitary tumors. Invasive surgery through the nostrils can remove these growths and restore a healthy function. If left untreated, cancerous tumors can spread to other internal organs and pose life-threatening issues [6,7].

Your adrenal glands are two small organs that sit on top of each kidney. The adrenal glands make different types of hormones you need to stay alive and healthy. Hormones are chemicals that travel in your bloodstream and control how different parts of your body work [8].

The adrenal glands make the hormones cortisol, aldosterone, adrenaline, and noradrenaline. They also make hormones that your body uses to make sex hormones (estrogen and testosterone). All of these hormones do many important jobs, including:

- Turning food into energy and managing blood sugar levels
- Balancing salt and water
- Keeping blood pressure normal
- Responding to illness and stress (your "fight or flight" response)
- Timing when and how fast a child develops sexually [9].

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When you have an adrenal gland disorder, your body makes too much or too little of one or more hormones. The symptoms depend on the type of problem you have and how much it affects the hormone levels in your body [10].

Health care providers use different tests to check for adrenal disorders depending on your symptoms and health history. For example, you may have tests of your blood, urine (pee), or saliva (spit). These tests check your hormone levels. Your provider may order x-rays, CT scans, or MRI scans to look for tumours. Different types of adrenal gland disorders have different treatments. They include medicines and surgery. Radiation therapy is sometimes a treatment for tumours [11]. There are treatments to cure certain adrenal gland disorders. For other disorders, treatments can manage your symptoms.

There are different conditions related to your adrenal glands. Some of the most common include:

- Addison's disease, also called adrenal insufficiency. In this disorder, you don't produce enough cortisol and/or aldosterone.
- Cushing's syndrome. In this disorder, your levels of cortisol are too high. This term can be applied when large doses of steroids are given to treat certain medical conditions [12].
- Congenital adrenal hyperplasia. This term refers to genetic condition in which your adrenal glands are not able to make cortisol well. As a result ACTH is elevated. Depending on the defect higher levels of male hormone might be made.
- Adrenal gland suppression. This is a type of adrenal insufficiency that is related to outside sources of cortisol or related synthetic hormones such as prednisone or dexamethasone.
- Hyperaldosteronism. If you have this condition, your body produces too much aldosterone which can lead to blood pressure elevation and potassium loss.
- Virilization. This condition happens when your body produces too much of the male sex hormones and is only apparent in females or boys before puberty [13].

There are also conditions of the adrenal glands related to growths (tumors). These include:

- Adrenal gland tumors. Tumors can disrupt hormone output, but are usually noncancerous.
- Adrenocortical carcinoma. This rare condition refers to cancer forming in the adrenal gland's outer layer.
- Pheochromocytoma. If you have this condition, your glands make too much epinephrine and norepinephrine which can raise blood pressure or make your heart race.
- Pituitary tumors. Abnormal growth on the pituitary gland can cause adrenal gland conditions by disrupting the amount of hormones made by the adrenal glands. ACTH producing tumors cause Cushing's disease. If tumors are large enough, they may press on the normal pituitary cells and cause deficiency of ACTH and secondary adrenal insufficiency [14].

Adrenal insufficiency happens when the adrenal glands don't produce enough cortisol and sometimes aldosterone. The production decreases when the adrenal cortex (the glands' outer layer) is destroyed. This occurs most often when you have an autoimmune disease that causes your body to attack the glands. It can also be caused by tumors, tuberculosis and other types of infections. This condition is known as primary adrenal insufficiency. Secondary adrenal insufficiency, which is more common than the primary form, happens because you don't have enough of adrenocorticotropin (ACTH), the hormone secreted by the pituitary gland. If your pituitary doesn't make enough ACTH, your adrenal glands don't make enough cortisol [15,16].

Secondary adrenal insufficiency most often happens when you have been taking glucocorticoids (like prednisone) for an extended amount of time and then stop too quickly rather than tapering down gradually. It can also develop due to tumors in the pituitary glands pressing on the normal pituitary cells or from surgery or radiation to the pituitary gland [17].

Adrenal crisis is a medical emergency. It's the most serious complication of adrenal insufficiency and happens due to a severe lack of cortisol. An adrenal crisis can be life-threatening. Symptoms of adrenal crisis include:

- Severe pain in your lower body that comes on quickly.

- Bouts of vomiting and diarrhea.
- Weakness.
- Confusion and loss of consciousness.
- Low blood glucose,
- Low blood pressure.

If you have adrenal insufficiency, you should always have an injectable form of glucocorticoid medicine with you and you should wear some type of medical alert jewelry with that information. Make sure your family and friends know how to give the injection in the case of an emergency. Other hormone imbalances and symptoms can occur with adrenal disorders. These include having too much potassium (hyperkalemia) or not enough sodium (hyponatremia) in your blood [18,19].

In many cases, the causes for adrenal disorders aren't known. However, some types of adrenal disorders are linked to genetics. Others may result more frequently if you have to take or choose to take certain types of drugs, such as steroids. Steroids are used to treat many types of diseases, but you should always be aware of their many side effects [20].

Adrenal gland disorders are caused by problems with the glands themselves that cause overproduction or underproduction of hormones. They are also caused by problems in other glands, such as the pituitary gland. Genetics can also play a part in certain adrenal disorders. In many cases, no one really knows why the disorders develop [21].

Our bodies are complex creations of interwoven systems that must work together in order for life to continue. When just one function fails or is compromised, our life and livelihood can be thrown into a tailspin.

A lesser-known piece of the much larger puzzle is the adrenal glands. While we are relatively unaware of their existence throughout our daily lives – they act as regulatory entities of an entire system. It's common to experience stomach aches, a sore throat, or stiff joints, but we don't usually suffer from an aching adrenal gland. The two quiet, undercover glands do their job without causing much fuss – usually [22]. The small, triangular-shaped adrenal glands sit atop each kidney and are composed of two parts – the cortex and the medulla. The adrenal cortex makes up the largest part of each adrenal gland and breaks out into three specific zones that

produce specific, vital hormones. The cortex also plays an important role in the adrenal glands' function by creating stress hormones. The entire gland is wrapped in a protective adipose capsule. The glands wrap around the top of each kidney like a glove [23].

While the adrenal glands are best known for the creation of adrenaline – a hormone that releases in stressful situations, generating the “fight or flight” reflex – it also produces corticosteroid hormones. This hormone group includes glucocorticoids and mineralocorticoids, which are responsible for regulating immune system responses, fighting inflammation, monitoring heart functions, and converting fats, proteins, and carbohydrates into energy.

In addition to these crucial duties, the main mineralocorticoid hormone – aldosterone – balances salt and water within the bloodstream, regulating the body's blood pressure. Without aldosterone, kidneys lose too much sodium and water, which can then generate a drop in blood pressure or life-threatening dehydration.

The adrenal glands also release sex hormones, androgen, and estrogen. In males, the adrenal glands ensure sex organs form correctly during the childhood development years. In females, the secretion of sex hormones is responsible for body hair growth during puberty.

Adrenal gland disorders run the gamut from causation and treatment, however, they can severely inhibit an individual from thriving, both physically and mentally. The following adrenal gland disorders include:

- Addison's disease. This adrenal insufficiency disorder is caused by underproducing adrenal glands and usually triggered by a previously existing autoimmune disorder like HIV, Lupus, and type I diabetes. The failure to produce adequate amounts of hormones, including cortisol and aldosterone, can result in fatigue, nausea, muscle weakness, and eventually lead to an Addisonian crisis or adrenal crisis – a life-threatening situation that requires immediate treatment and hospitalization.
- Cushing's disease. In direct opposition to Addison's disease, Cushing's is caused by the overproduction of hormones within the adrenal glands. They send too much cortisol into the bloodstream, causing obesity, high blood pressure, excessive facial hair, irregular menstrual cycles, and susceptibility

to bruising. These symptoms can absolutely deter from high quality of life and require a professional diagnosis, monitoring, and treatment.

- Adrenal incidentaloma. Caused by masses or tumors found on the adrenal glands, the masses could secrete additional hormones and wreak havoc on the body. Surgery is often needed to remove them.
- Pheochromocytomas. Those with this adrenal disorder suffer from tumors that grow in the medulla, leading to the overproduction of epinephrine and norepinephrine. An excess of these hormones causes high blood pressure, which could eventually cause heart attacks or stroke.
- Pituitary tumors. Situated at the base of the brain, the pituitary gland is also responsible for releasing hormones into our bodies. Certain hormones, including adrenocorticotropic, trigger the adrenal glands to pump cortisol into the bloodstream. A lack of communication between the pituitary gland and the adrenal glands because of benign or cancerous tumors can throw the whole system out of whack.
- Adrenal gland suppression. Steroid usage often leads to the suppression of adrenal glands. Since steroids mimic cortisol, the adrenal glands can be notified to release less of this cortisol. When steroid medication is immediately halted, the adrenal glands may not receive the message to take up the creation of cortisol. A hormone imbalance can ensue and proceed for weeks or even months until the adrenal glands balance out again.

## Discussion

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## Conclusion

For adrenal disorders involving tumours, there is a chance for curability. When found early and removed, adrenal cancer can be halted altogether. The same goes for Pituitary tumours. Invasive surgery through the nostrils can remove these growths and restore a healthy function. If left untreated, cancerous tumors can spread to other internal organs and pose life-threatening issues. The adrenal glands play an important part in keeping your body healthy. Disorders of these glands can affect many body functions. Your healthcare provider may suggest you see an endocrinologist regularly to monitor your condition. Your treatment plan might change when your situation changes, such as when you are in a high-stress time during an illness or surgery. Most of the adrenal disorders are manageable when you become an active part of your healthcare team.

## Acknowledgement

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## Conflict of Interest

None

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