

# Difference Between Addison Disease and Cushing Syndrome

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## Key Difference - Addison Disease vs Cushing Syndrome

Both Addison disease and Cushing syndrome are **endocrine** disorders. The key difference between Addison disease and Cushing syndrome is that **there is a hormonal insufficiency of cortisol and aldosterone in Addison disease whereas there is an excess of cortisol in Cushing syndrome**. It is important to know the difference between Addison disease and Cushing syndrome in order to diagnose and treat them properly.

## What is Cushing Syndrome?

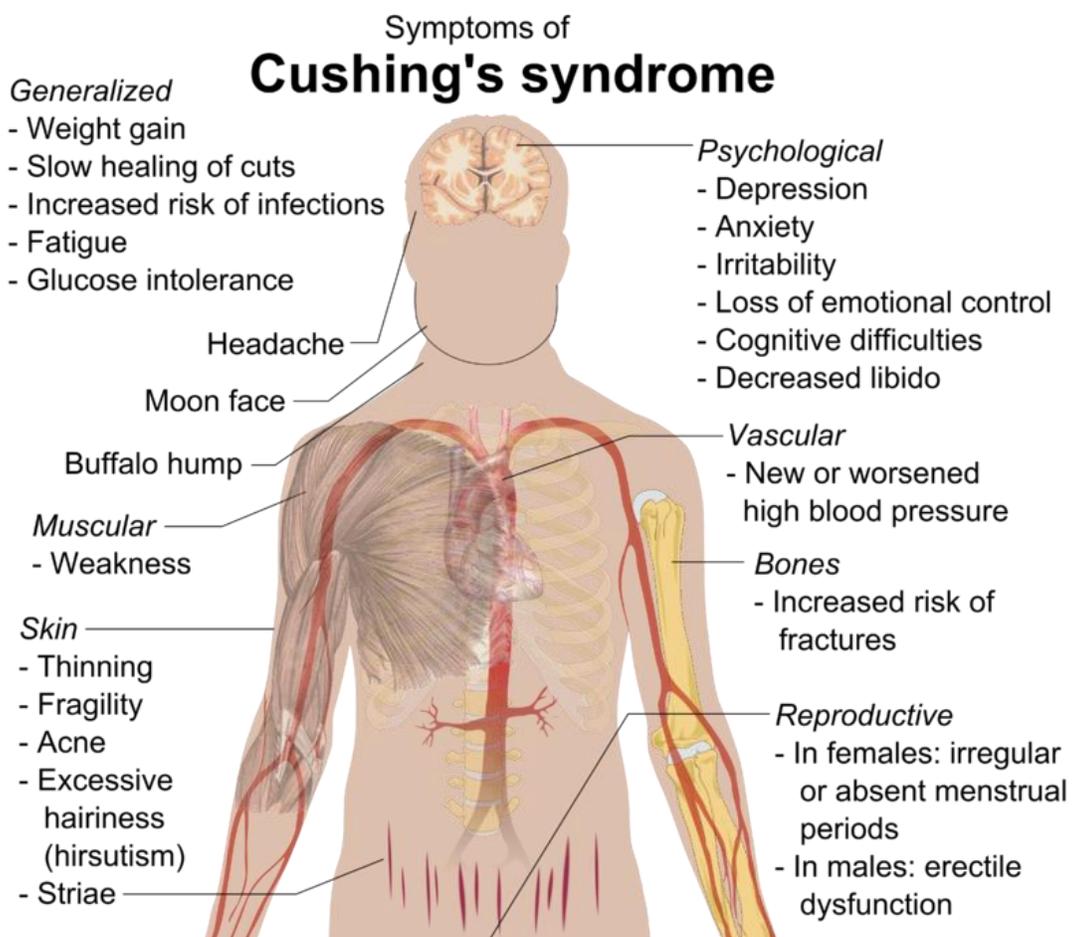
A set of clinical features that appear consistently together because of the excessive stimulation of the glucocorticoid receptors is called the Cushing syndrome.

- Iatrogenic causes such as the long term administration of glucocorticoids
- Pituitary **adenomas** – when the clinical features are due to a pituitary adenoma that condition is named as the Cushing disease
- Malignancies such as bronchial carcinomas, adrenal carcinomas, and small cell lung carcinomas
- Adrenal adenomas
- ACTH independent macronodular hyperplasia
- Alcohol excess
- Depressive ailments
- Primary **obesity**

## Clinical Features

- Hair thinning
- Hirsutism
- **Acne**
- Plethora
- **Psychosis**
- **Cataract**

- Moon face
- Peptic ulcers
- Loss of height and back pain because of the compression fractures
- Hyperglycemia
- Menstrual disturbances
- Osteoporosis
- Immune suppression
- Bruising
- Central obesity
- Striae
- Hypertension



**Figure 01: Symptoms of Cushing Syndrome**

The presence of few related clinical symptoms, however, is not a conclusive enough evidence to make a diagnosis of Cushing syndrome. There can be alterations in the glucocorticoid level of the body because of other illnesses such as

obesity and depression. Therefore any clinical suspicion of Cushing syndrome should be confirmed by doing further investigations. The drug history of the patient is extremely important to exclude any iatrogenic causes. If the Cushing syndrome is due to a malignancy, the appearance of the clinical features usually happens rapidly, and there is coexisting cachexia.

## **Investigations**

Because of the limitations in the specificity and the sensitivity of the techniques, several test results are combined together when arriving at a diagnosis in order to increase the accuracy of the process. The investigations aim at,

- Establishing whether the patient has Cushing syndrome
- Identifying the underlying pathology

### **Establishing the Presence of Cushing syndrome**

If two of the three tests mentioned below give positive results, this confirms the presence of Cushing syndrome.

- Increase in the 24-hour urine free cortisol level
- Inability to suppress the serum cortisol level by the administration of oral dexamethasone
- Change in the circadian rhythm of cortisol secretion

### **Determining the Underlying Pathology**

ACTH level is measured for the purpose of establishing the underlying pathology. If the level is undetectably low, this points towards an adrenal cause. On the other hand, abnormally high levels of ACTH suggest a pituitary cause.

MRI and CT scans can be done to identify any [tumors](#) in the brain to cement the diagnosis.

## **Management**

In the management of the Cushing syndrome, priority is given to the surgical interventions. Various drugs are administered to keep the cortisol level at bay until

the surgery is done. The management varies depending on the underlying pathology.

### **Cushing Disease**

- Trans sphenoidal surgery
- Laparoscopic bilateral adrenalectomy

### **Adrenal Tumors**

- Laparoscopic adrenal surgery
- Radiotherapy

## **What is Addison Disease?**

The adrenocortical insufficiency occurring as a result of the destruction or dysfunction of the adrenal cortex is called the Addison disease. By the time the clinical features appear, about 90% of both adrenal cortices have been destroyed.

### **Causes**

- [Autoimmune diseases](#)
- [Tuberculosis](#)
- Neoplasms
- Inflammatory necrosis
- Amyloidosis
- Hemochromatosis
- Waterhouse-Friedrichsen syndrome following the meningococcal septicemia
- Bilateral adrenalectomy

### **Clinical Features**

Since the entire adrenal cortex is affected, the production of both cortisol and aldosterone is drastically reduced. This hormonal imbalance gives rise to a variety of clinical manifestations.

### **Symptoms due to Cortisol Deficiency**

- Lethargy and Weakness

The reduction in the cortisol levels increases the insulin sensitivity of the body tissues, resulting in hypoglycemia. Glycogen stored in the liver is used to compensate this hypoglycemic state, and with their depletion, the compensatory mechanism also fails, making the patient weak and lethargic.

- Immune suppression
- Muscle weakness
- Irritability
- Mood changes
- Hypotension
- Weight loss

### **Symptoms due to Aldosterone Deficiency**

- Arrhythmias – due to the resultant hyponatremia and hyperkalemia
- CNS disturbances
- Nausea
- Diarrhea
- Vomiting
- Metabolic acidosis
- Hypovolemia
- Hypotension

Another unique clinical feature of the Addison disease is the hyperpigmentation due to the increased ACTH level which has MSH like activity.

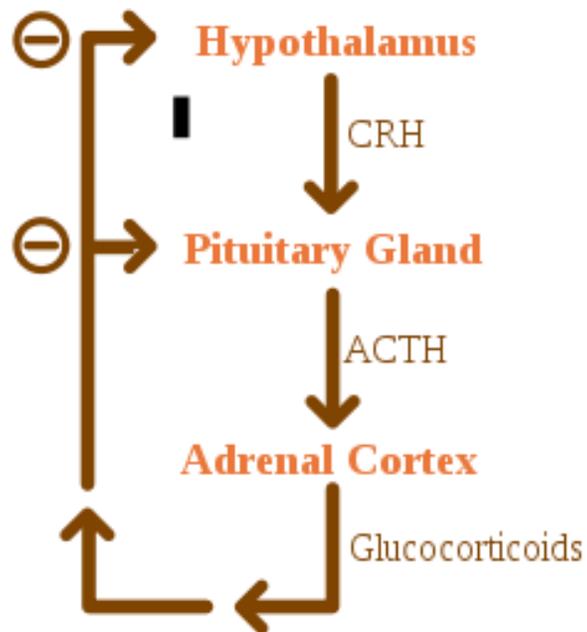


Figure 02: Physiologic negative feedback loop for glucocorticoids

## Adrenal Crisis

Adrenal crisis is a medical emergency where the patient suffers from fever, vomiting, diarrhea and a marked reduction in the blood pressure. If not treated immediately the patient can die of hypovolemic shock. This can happen even in the individuals with no previous history of adrenal diseases. The commonest cause of the adrenal crisis is the bilateral adrenal hemorrhage, which is frequently seen in the neonates and in adults taking anticoagulant drugs such as Warfarin. This condition is treated with glucocorticoids and saline.

## Treatment

The Addison disease is treated by the administration of synthetic hormones to restore the normal levels of aldosterone and cortisol.

## What are the similarities between Addison Disease and Cushing Syndrome?

- Both conditions are because of the structural or functional changes in the adrenal gland.

# What is the difference between Addison Disease and Cushing Syndrome?

| Addison Disease vs Cushing Syndrome  |   |
|--|---|
| Addison disease is the adrenocortical insufficiency occurring as a result of the destruction or dysfunction of the adrenal cortex. | Cushing syndrome is a set of clinical features that appear consistently together due to the excessive activation of the glucocorticoid receptors. |
| Cortisol and Aldosterone Levels  |   |
| In Addison disease, both cortisol and aldosterone levels are affected.   | Only the cortisol level is affected in the Cushing syndrome.  |
| Effect on Cortisol Level   |   |
| Cortisol level is reduced in the Addison disease.  | Cushing syndrome is characterized by the elevation in the cortisol level.   |
| Symptoms   |   |
| Hypotension and hypoglycemia are clinical features of this endocrine disorder.   | In Cushing syndrome, hypertension and hyperglycemia are observed as symptoms.   |

## Summary – Addison Disease vs Cushing Syndrome

The early diagnosis of these endocrine disorders is important because they may be the manifestation of serious underlying causes such as malignancies. The main difference between Addison disease and Cushing syndrome is that Addison disease is characterized by the hormonal insufficiency of cortisol and aldosterone whereas Cushing syndrome is characterized by an excess of cortisol. In prescribing the

anti-inflammatory corticosteroids, the patient should be followed up to prevent the development of unnecessary and avoidable complications like the Cushing syndrome.

### Reference:

1. Hayes, P. C., K. J. Sympton, and O. J. Garden. "Davidson's Principles and practice of Medicine." (2002).

### Image Courtesy:

1."Cushing's syndrome" By Mikael Häggström – Own work (CC0) via [Commons Wikimedia](#)  
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