



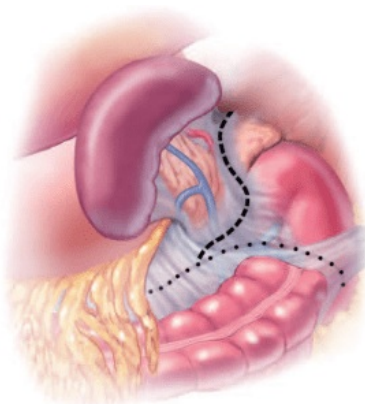
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Adrenal Gland Removal (Adrenalectomy) Surgery Patient Information from SAGES

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About Adrenal Glands

What are the Adrenal Glands?



The adrenal glands are two small organs, one located above each kidney. They are triangular in shape and about the size of a thumb. The adrenal glands are known as endocrine glands because they produce hormones. These hormones are involved in control of blood pressure, chemical levels in the blood, water use in the body, glucose usage, and the “fight or flight” reaction during times of stress. These adrenal-produced hormones include cortisol, aldosterone, the adrenaline hormones – epinephrine and norepinephrine – and a small fraction of the body’s sex hormones (estrogen and androgens).

What Causes Adrenal Gland Problems?

Diseases of the adrenal gland are relatively rare. The most common reason that a patient may need to have the adrenal gland removed is excess hormone production by a tumor located within the adrenal. Most of these tumors are small and not cancers. They are known as benign growths that can usually be removed with laparoscopic techniques. Removal of the adrenal gland may also be required for certain tumors even if they aren’t producing excess hormones, such as very large tumors or if there is a suspicion that the tumor could

be a cancer, or sometimes referred to as malignant. Fortunately, malignant adrenal tumors are rare. An adrenal mass or tumor is sometimes found by chance when a patient gets an X-ray study to evaluate another problem.

What are the Symptoms of Adrenal Gland Problems?

Patients with adrenal gland problems may have a variety of symptoms related to excess hormone production by the abnormal gland. Adrenal tumors associated with excess hormone production include pheochromocytomas, aldosterone-producing tumors, and cortisol-producing tumors. Some of these tumors and their typical features are given below.

- **Pheochromocytomas** produce excess hormones that can cause very high blood pressure and periodic spells characterized by severe headaches, excessive sweating, anxiety, palpitations, and rapid heart rate that may last from a few seconds to several minutes.
- **Aldosterone** producing tumors cause high blood pressure and low serum (blood) potassium levels. In some patients this may result in symptoms of weakness, fatigue, and frequent urination.
- **Cortisol** producing tumors cause a syndrome termed Cushing's syndrome that can be characterized by obesity (especially of the face and trunk), high blood sugar, high blood pressure, menstrual irregularities, fragile skin, and prominent stretch marks. Most cases of Cushing's syndrome, however, are caused by small pituitary tumors and are not treated by adrenal gland removal. Overall, adrenal tumors account for about 20% of cases of Cushing's syndrome.
- An incidentally found mass in the adrenal may be any of the above types of tumors, or may produce no hormones at all. Most incidentally found adrenal masses do not make excess hormones, cause no symptoms, are benign, and do not need to be removed. Surgical removal of incidentally discovered adrenal tumors is indicated only if:
 - The tumor is found to make excess hormones
 - Is large in size (more than 4-5 centimeters or 2 inches in diameter)
 - If there is a suspicion that the tumor could be malignant.
- **Adrenal gland cancers (adrenal cortical cancer)** are rare tumors that are usually very large at the time of diagnosis. Removal of these tumors is usually done by open adrenal surgery.

If an adrenal tumor is suspected based on symptoms or has been identified by X-ray, the patient should undergo blood and urine tests to determine if the tumor is over-producing hormones.

Special X-ray tests, such as a CT scan, nuclear medicine scan, an MRI or selective venous sampling are commonly used to locate the suspected adrenal tumor.

Surgical removal of the adrenal gland is the preferred treatment for patients with adrenal tumors that secrete excess hormones and for primary adrenal tumors that appear malignant.

Laparoscopic Adrenal Gland Removal

What are the Advantages of Laparoscopic Adrenal Gland Removal?

In the past, making a large 6 to 12 inch incision in the abdomen, flank, or back was necessary for removal of an adrenal gland tumor. Today, with the technique known as minimally invasive surgery, removal of the adrenal gland (also known as “laparoscopic adrenalectomy”) can be performed through three or four 1/4-1/2 inch incisions. Patients may leave the hospital in one or two days and return to work more quickly than patients recovering from open surgery. Results of surgery may vary depending on the type of procedure and the patients overall condition.

Common advantages are:

- Less postoperative pain
- Shorter hospital stay
- Quicker return to normal activity
- Improved cosmetic result
- Reduced risk of herniation or wound separation

Are You a Candidate for Laparoscopic Adrenal Gland Removal?

Although laparoscopic adrenal gland removal has many benefits, it may not be appropriate for some patients. Obtain a thorough medical evaluation by a surgeon qualified in laparoscopic adrenal gland removal in consultation with your primary care physician or endocrinologist to find out if the technique is appropriate for you.

What Preparation is Required?

Prior to the operation, some patients may need medications to control the symptoms of the tumor, such as high blood pressure.

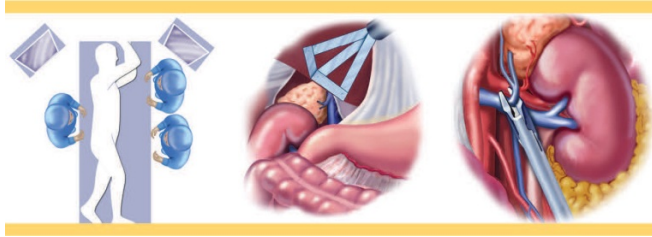
- Patients with a pheochromocytoma (see previous page) will need to be started on special medications several days prior to surgery to control their blood pressure and heart rate.
- Patients with an aldosterone-producing tumor (see previous page) may need to have their serum potassium checked and take extra potassium if the level is low.

- Patients with Cushing's syndrome (see previous page) will need to receive extra doses of cortisone medication on the day of surgery and for a few months afterwards until the remaining adrenal gland has resumed normal function.
- Preoperative preparation includes blood work, medical evaluation, chest x-ray and an EKG depending on your age and medical condition.
- After your surgeon reviews with you the potential risks and benefits of the operation, you will need to provide written consent for surgery.
- Blood transfusion and/or blood products may be needed depending on your condition.
- It is recommended that you shower the night before or morning of the operation.
- After midnight the night before the operation, you should not eat or drink anything except medications that your surgeon has told you are permissible to take with a sip of water the morning of surgery.
- Drugs such as blood thinner, anti-inflammatory medications and large doses of Vitamin E may need to be stopped temporarily for a short time period before surgery.
- Diet medication or St. John's Wort should not be used for the two weeks prior to surgery.
- Quit smoking and arrange for any help you may need at home.

Laparoscopic Adrenal Gland Removal Procedure

How is Laparoscopic Adrenal Gland Removal Performed?

- The surgery is performed under a complete general anesthesia, so that the patient is asleep during the procedure.
- A cannula (a narrow tube-like instrument) is placed into the abdominal cavity in the upper abdomen or flank just below the ribs.
- A laparoscope (a tiny telescope) connected to a special camera is inserted through the cannula. This gives the surgeon a magnified view of the patient's internal organs on a television screen.
- Other cannulas are inserted which allow your surgeon to delicately separate the adrenal gland from its attachments. Once the adrenal gland has been dissected free, it is placed in a small bag and is then removed through one of the incisions. It is almost always necessary to remove the entire adrenal gland in order to safely remove the tumor.
- After the surgeon removes the adrenal gland, the small incisions are closed.



What Happens if the Procedure Cannot Be Performed Laparoscopically?

In a small number of patients the laparoscopic method cannot be performed. In that situation, the operation is converted to an open procedure. Factors that may increase the possibility of choosing or converting to the “open” procedure may include:

- Obesity
- A history of prior abdominal surgery causing dense scar tissue
- Inability to visualize the adrenal gland clearly
- Bleeding problems during the operation
- Certain tumor characteristics such as large size or invasion into adjacent structures.
- The decision to perform the open procedure is a judgment decision made by your surgeon either before or during the actual operation. When the surgeon feels that it is safest to convert the laparoscopic procedure to an open one, this is not a complication, but rather sound surgical judgment. The decision to convert to an open procedure is strictly based on patient safety.

Expected Outcomes

What Should I Expect after Surgery?

After the operation, it is important to follow your doctor’s instructions. Although many people feel better in just a few days, remember that your body needs time to heal.

- After laparoscopic adrenal gland removal, most patients can be cared for on a regular surgical nursing unit. Occasionally, a patient with a pheochromocytoma may require admission to an intensive care unit after surgery to monitor their blood pressure. Most patients can be discharged from the hospital within one or two days after surgery.
- Patients with an aldosterone-producing tumor will need to have their serum potassium level checked after surgery and may need to continue to take medications to control their blood pressure.
- Patients with cortisol-producing tumors and Cushing’s syndrome will need to take prednisone or cortisol pills after surgery. The dose is then tapered over time as the remaining normal adrenal gland resumes adequate production of cortisol hormone.

- Patients are encouraged to engage in light activity while at home after surgery. Patients can remove any dressings and shower the day after the operation.
- Post-operative pain is generally mild and patients may require a pain pill or pain medication.
- Most patients can resume normal activities within one week, including driving, walking up stairs, light lifting, and work.
- You should call and schedule a follow-up appointment within 2 to 3 weeks after your operation.

What Complications Can Occur?

As with any operation, there is a risk of a complication. Complications during the operation may include:

- Adverse reaction to general anesthesia
- High blood pressure
- Bleeding
- Injury to other organs
- Wound problems, blood clots, heart attacks, and other serious complications are uncommon after laparoscopic adrenalectomy

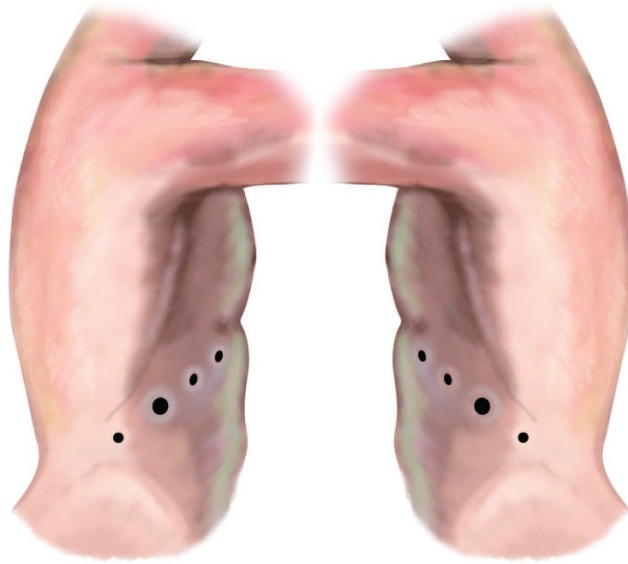
When to Call Your Doctor

Be sure to call your physician or surgeon if you develop any of the following:

- Persistent fever over 101 degrees F (39 C)
- Bleeding
- Increasing abdominal swelling
- Pain that is not relieved by your medications
- Persistent nausea or vomiting
- Chills
- Persistent cough or shortness of breath
- Purulent drainage (pus) from any incision
- Redness surrounding any of your incisions that is worsening or getting bigger
- You are unable to eat or drink liquids

This brochure is not intended to take the place of your discussion with your surgeon about the need for adrenal gland surgery. If you have questions about your need for adrenal gland surgery, your alternatives billing or insurance coverage, or your surgeons training and

experience, do not hesitate to ask your surgeon or his/her office staff about it. If you have questions about the operation or subsequent follow-up, please discuss them with your surgeon before or after the operation.



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