

# Laparoscopic Splenectomy and Adrenalectomy

A simple guide to help answer your  
questions about surgery



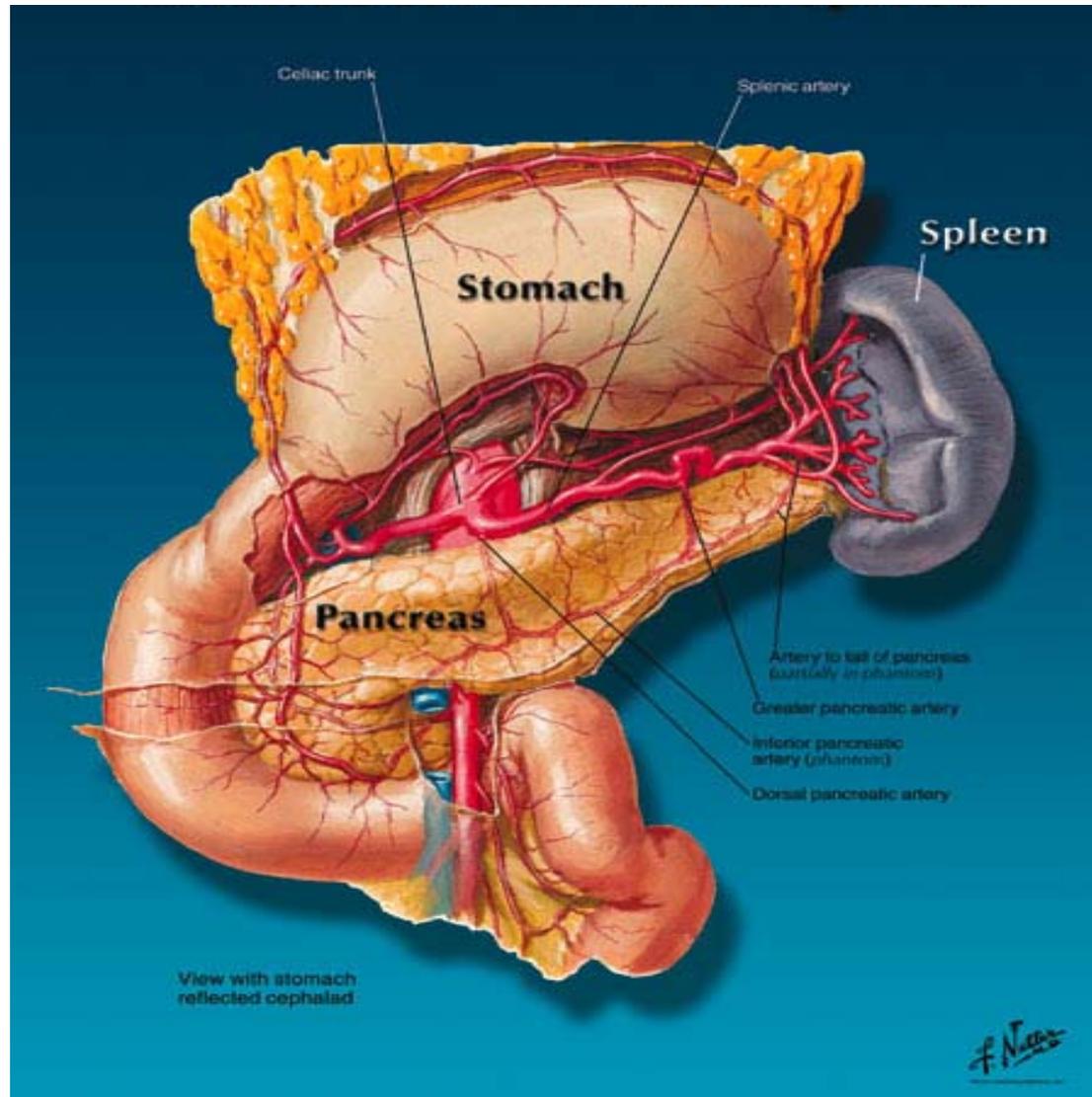


# What is a spleen?

- The spleen is a solid organ that lies in the upper left side of the abdomen, just below the ribs and diaphragm muscle.
- The spleen removes old and damaged blood cells from circulation and assists with the body's immune function.



# What is a spleen?

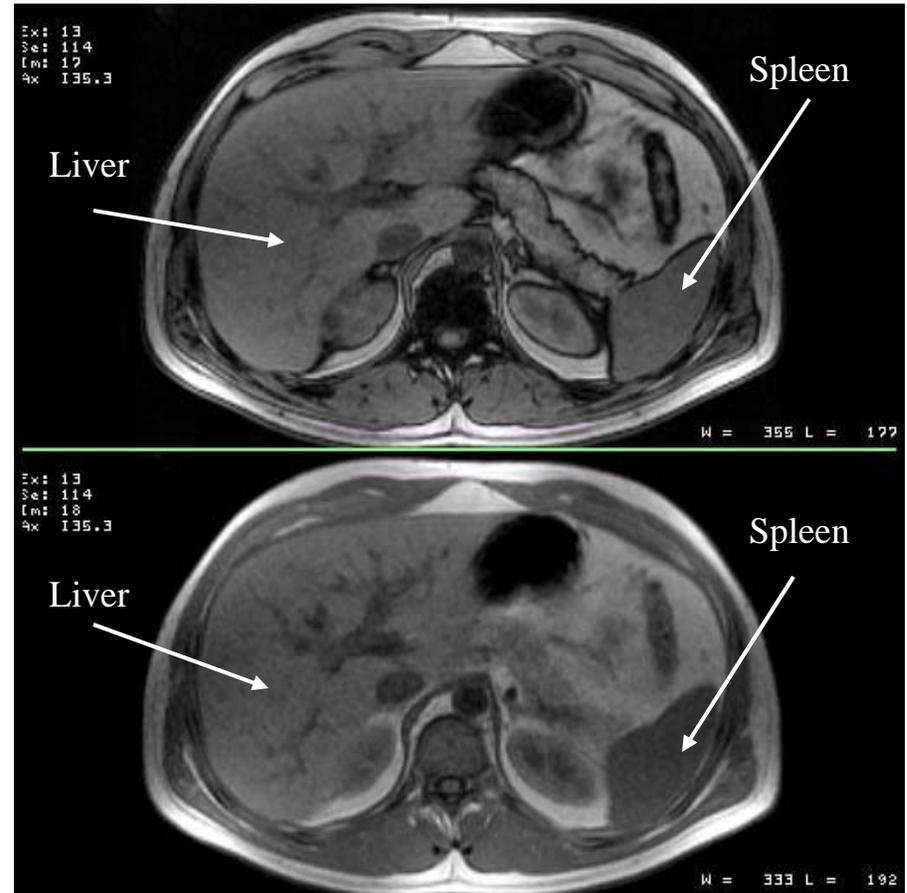




# What does the normal spleen look like?



Intraoperative photo of the normal spleen



MRI of the Abdomen in a normal patient



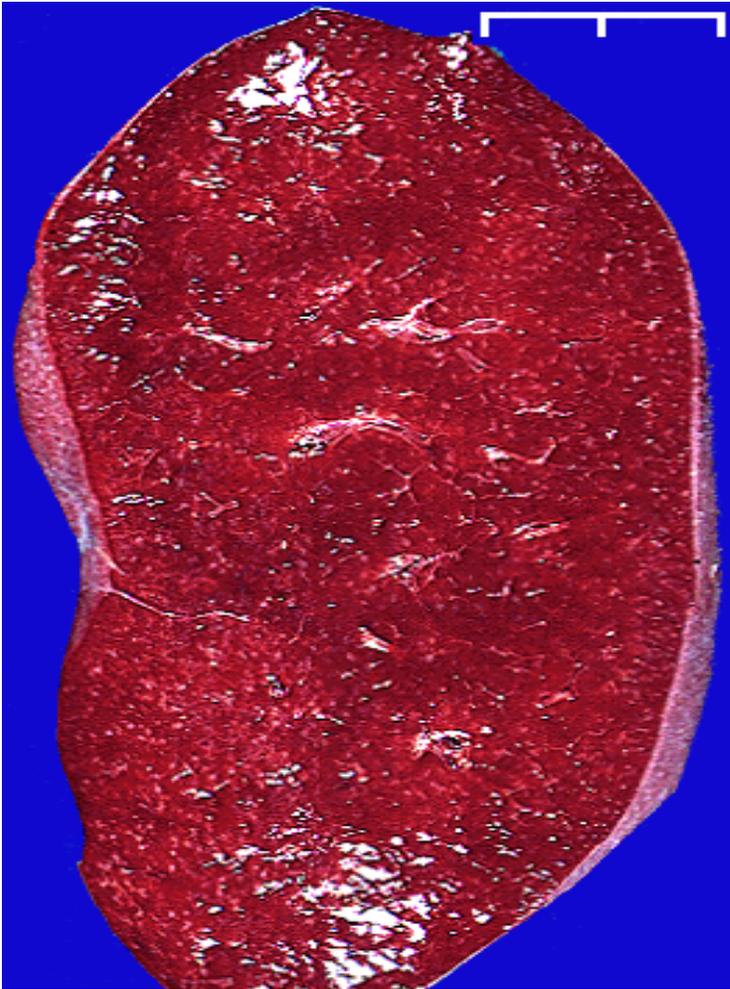
# Ultrasound of a normal spleen



Arrows point to the outline of the spleen



# What does a normal spleen look like?



This is a picture of a normal spleen which has been cut in half. The red “pulpy” material in the center functions like a sponge to trap and absorb bacteria and defective blood cells.



# Problems which can occur with the Spleen

- Hypersplenism – abnormal destruction of blood cells by the spleen, which results in an abnormally low number or deficiency of these cells. This cause the spleen to drastically enlarge
  - **Red blood cell** destruction results in anemia (low blood count).
  - **Platelet** (cells involved in making blood clots) destruction results in bleeding and bruising problems.

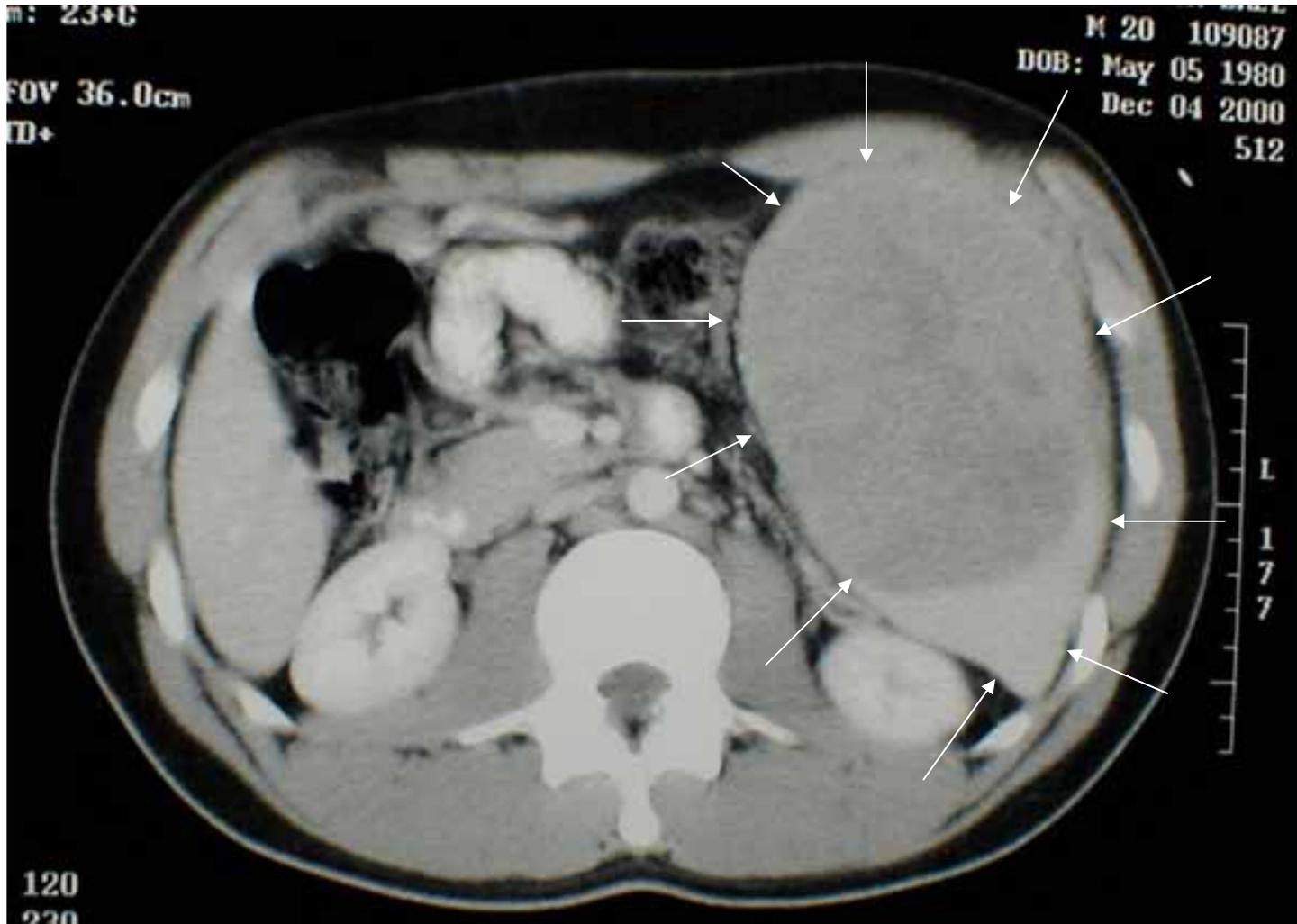


# Specific Types of Diseases which cause enlargement of the Spleen

- **Hereditary spherocytosis** – abnormally shaped blood cells are collected by the spleen causing it to enlarge
- **Idiopathic thrombocytopenic purpura (ITP)** – Abnormal Antibodies attack the bodies own platelets
- **Thrombotic thrombocytopenic purpura (TTP)** – poorly understood disease which causes the spleen to enlarge
- **Hemolytic anemia** – fragile blood cells burst and break. They are collected by the spleen causing it to enlarge
- **Lymphoma** – cancer which can affect the spleen
- **Acute or chronic leukemia** – cancer which affects the blood cells – these cells are then collected by the spleen causing it to enlarge



# CT Scan of an enlarged spleen



Arrows point to the outline of an extremely enlarged spleen



# When should the spleen be removed?

- The primary treatment for most diseases of the spleen is medical therapy (drugs). This may include a steroid medication like prednisone.
- If the medical treatment is not successful in restoring the blood count to normal and/or reducing the size of the spleen, the spleen should be removed.
- A hematologist (a specialist in diseases of the blood cells) usually decides what treatment will be best for each patient.



# Can I live without my spleen?

- Most people live a completely normal life without the spleen. Children are more affected if they lose their spleen because of their immature immune system
- A vaccination against certain bacteria (pneumococcus and haemophilus) should be given before the spleen is removed if possible to help minimize the risk of these types of infections in the future.



# How is the spleen removed?

A surgeon carefully separates the spleen from the other organs and structures near it. The surgeon then “disconnects” the spleen from all of the large blood vessels which bring blood to and from the spleen. The spleen is then removed from the body.



# How is the spleen removed?

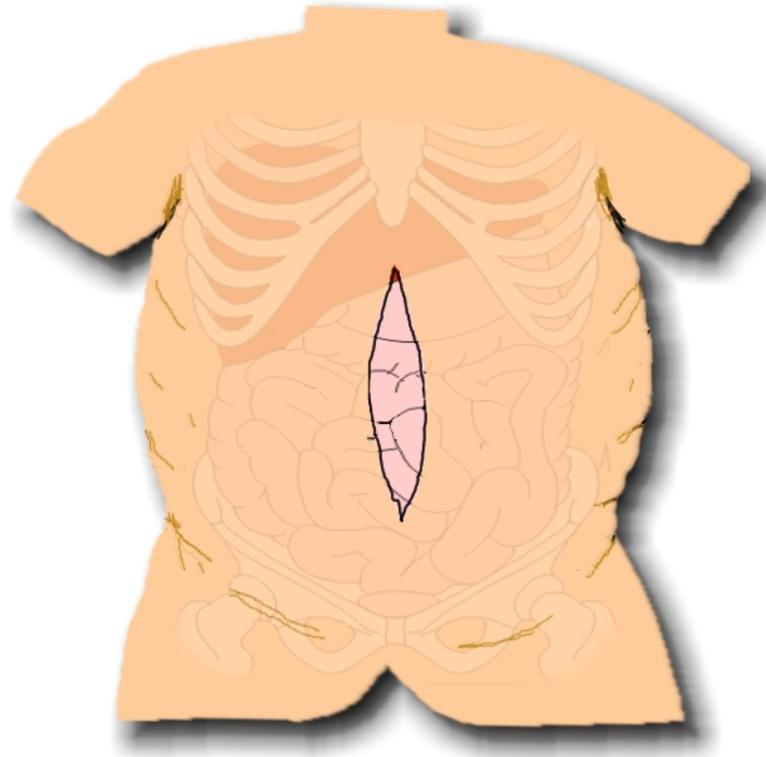
The surgery can be performed in 2 different ways:

- **Open** – where a large incision is made so that the surgeon can put his hands into the patient's body
- **Laparoscopic** – where several very small incisions are used so that cameras and small instruments can be placed into the body to perform the surgery



# Open splenectomy

- An incision is made under the lowest rib on the left side of the abdominal wall or in the middle of the upper half of the abdominal wall



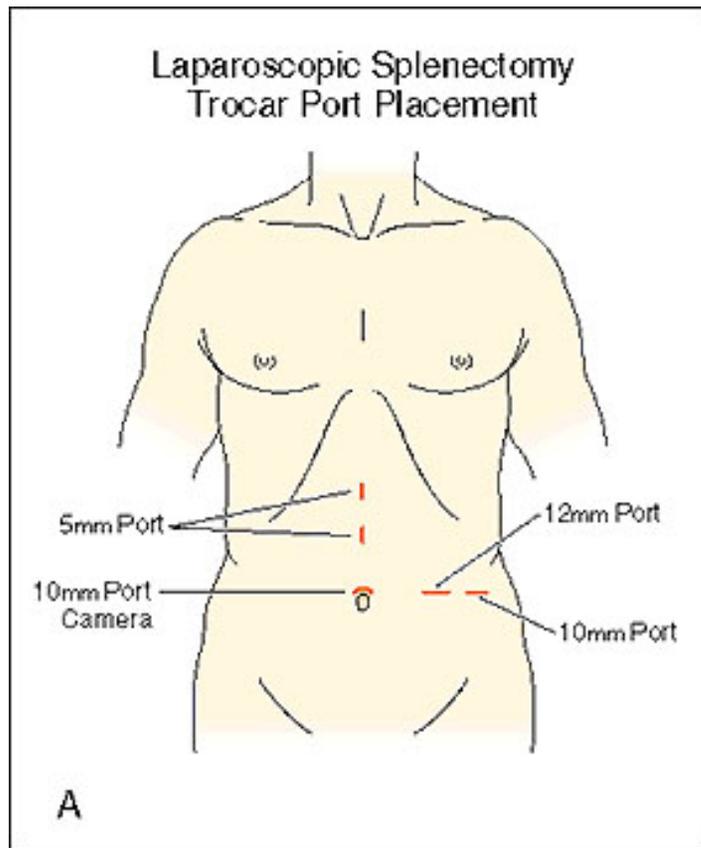


# Laparoscopic splenectomy

- 3-4 small incisions are made, each about  $\frac{1}{2}$  inch in size.
- The abdominal cavity is filled with carbon dioxide gas to create a space to work in.
- A telescope with a video camera shows everything inside the abdomen on a television screen in the operating room.



# Laparoscopic splenectomy



Location of ports for surgery (3 or 4 necessary)



Photo of Operating Room with video towers



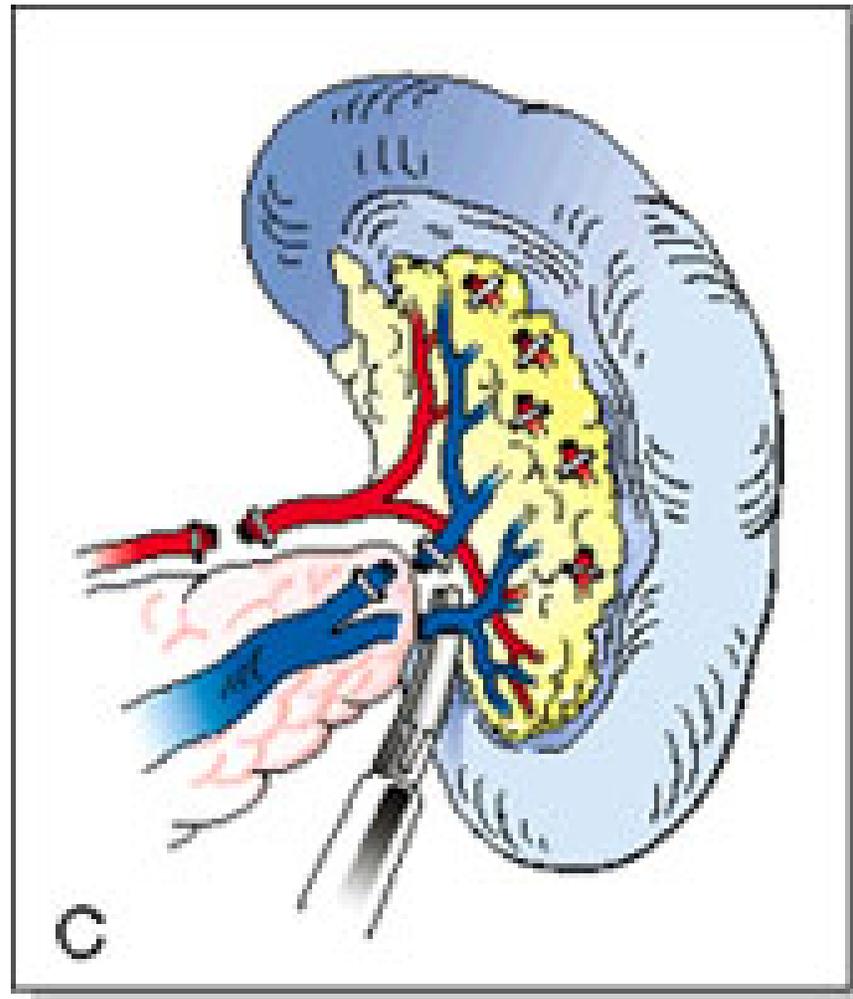
# Splenectomy

- The operation is the same on the inside.
- The blood supply to the spleen is tied and divided.
- The thin fibrous attachments between the spleen and the diaphragm are divided.
- The spleen is removed.
- In laparoscopic splenectomy, the spleen is placed into a small bag inside the abdominal cavity and then pulled out through one of the small incisions.



# Control of the blood vessels before removal to prevent bleeding

The arteries and veins which carry blood to and from the spleen are either clipped or cauterized (sealed with heat) to prevent bleeding





# Splenectomy

- Some surgeons feel that their ability to see fine detail is improved with a laparoscopic procedure. The laparoscope provides magnification and high intensity light so that the surgeon can see small details and into “nooks and crannies” easier.

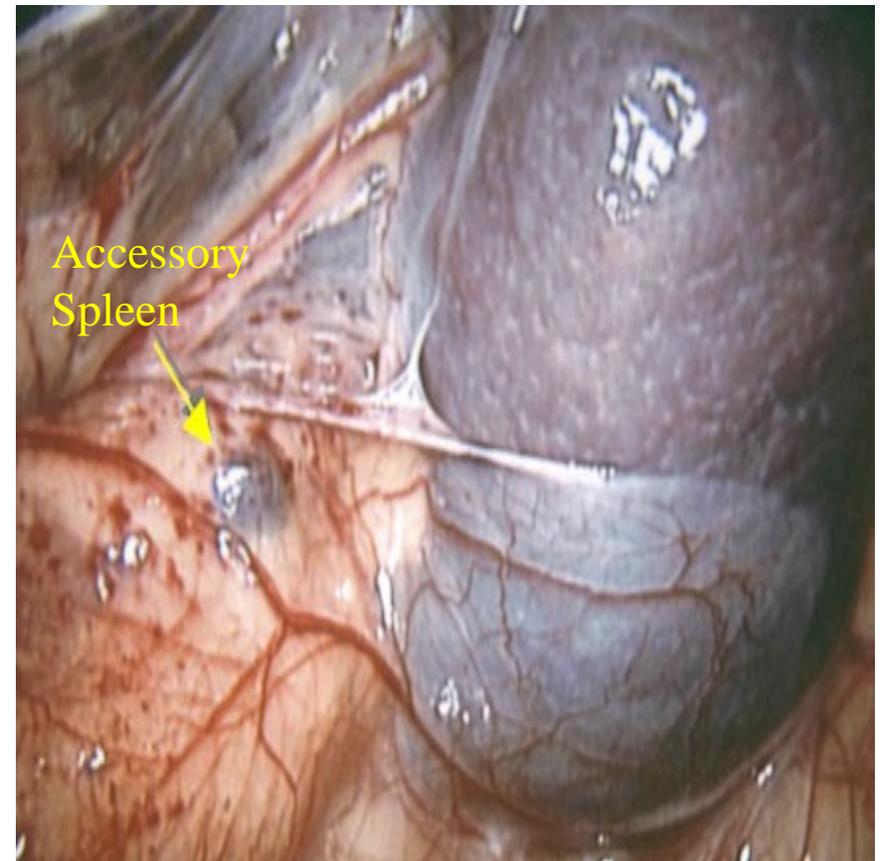
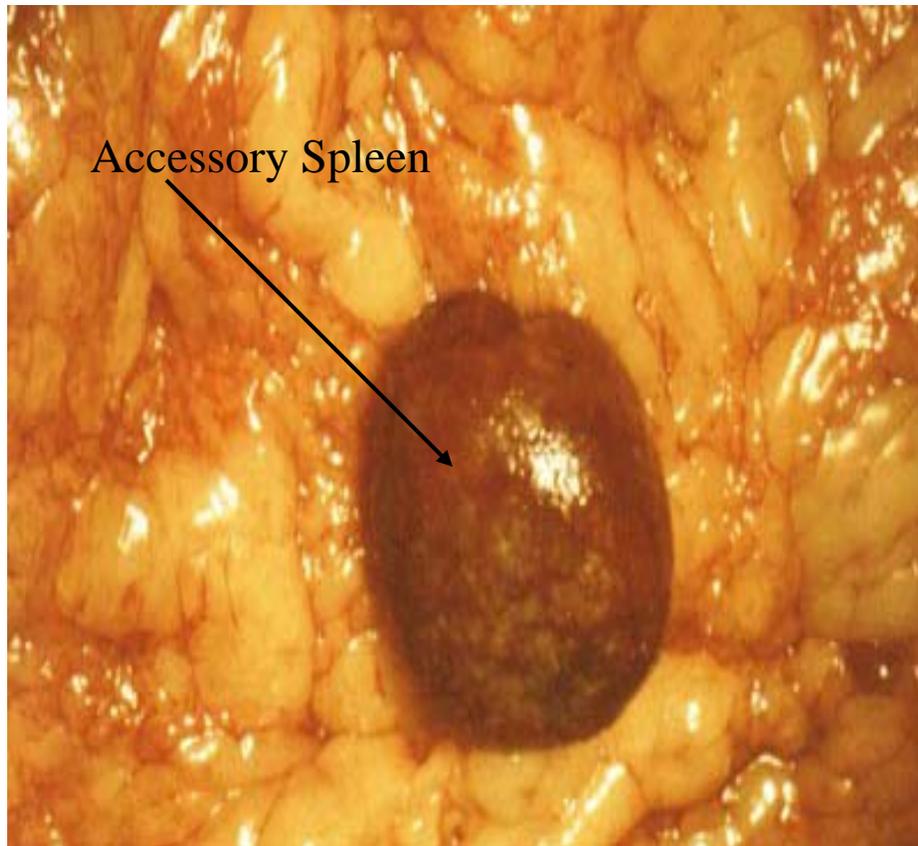


# Splenectomy

- About 10% – 15% of people have accessory spleens (extra small bits of spleen tissue). If these are not removed at the time of surgery, the patient may not be cured of their disease.



# Accessory Spleen





# What is the recovery after surgery?

- After open splenectomy, most patients stay in the hospital for 3 to 4 days and can return to full physical activity in 4 to 6 weeks.
- After laparoscopic splenectomy, most patients stay in the hospital overnight and can return to full physical activity in 2-3 weeks.



# What is the recovery after surgery?

- Pain after a laparoscopic operation is usually much less than after an open surgery.
- Cosmetically, the scar after a laparoscopic surgery is much smaller and generally less noticeable



# What are the risks of splenectomy?

- Bleeding and the need for a blood transfusion
- Injury to the bowel, stomach, pancreas, or another organ in the area of the spleen
- Hernia
- Infection or abscess
- Blood clot in the veins of the leg or in the lung
- Death



# What are the risks of splenectomy?

- Post-splenectomy sepsis – serious body-wide infection following removal of the spleen.
- This is rare, occurring in approximately 0.6% of adult patients after surgery. Children are more susceptible to this problem due to their immature immune system
- To avoid this, patients undergoing splenectomy should receive a pneumococcal vaccination prior to surgery.

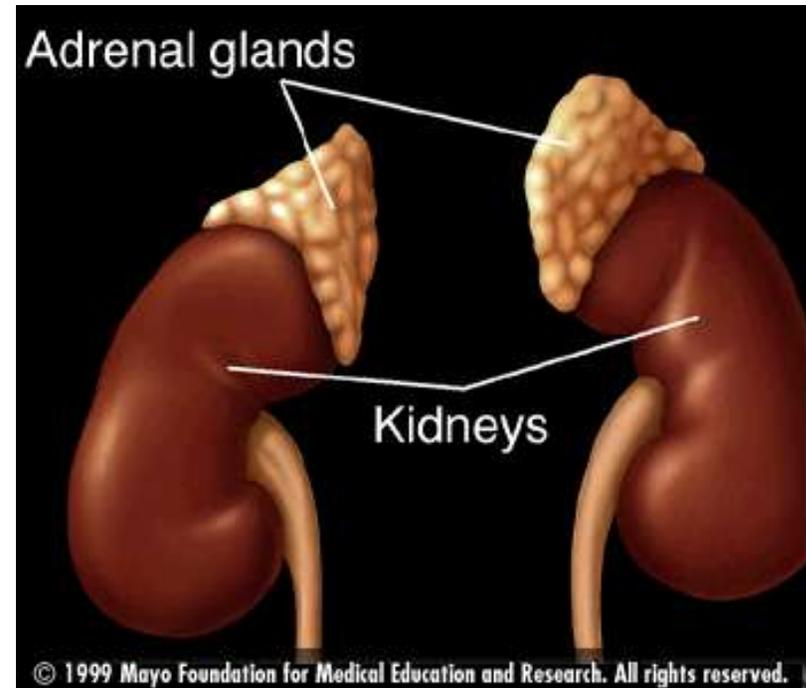
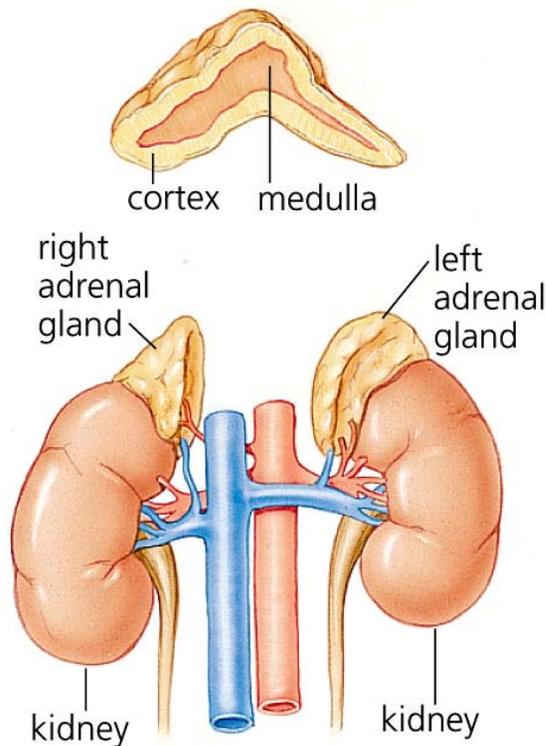


# What is an adrenal gland?

- There are two adrenal glands (one on the left and one on the right). They are small, triangular solid organs that are located on top of the kidneys.
- They measure between 1 and 3 inches in length.
- They produce adrenaline, cortisone, and aldosterone, which regulate the body's fluid and electrolyte (salt) balance. They also produce sex hormones.



# What is an adrenal gland?



The Adrenal Glands sit just above the kidneys on both sides of the body



# Normal Adrenal glands

Right Adrenal Gland

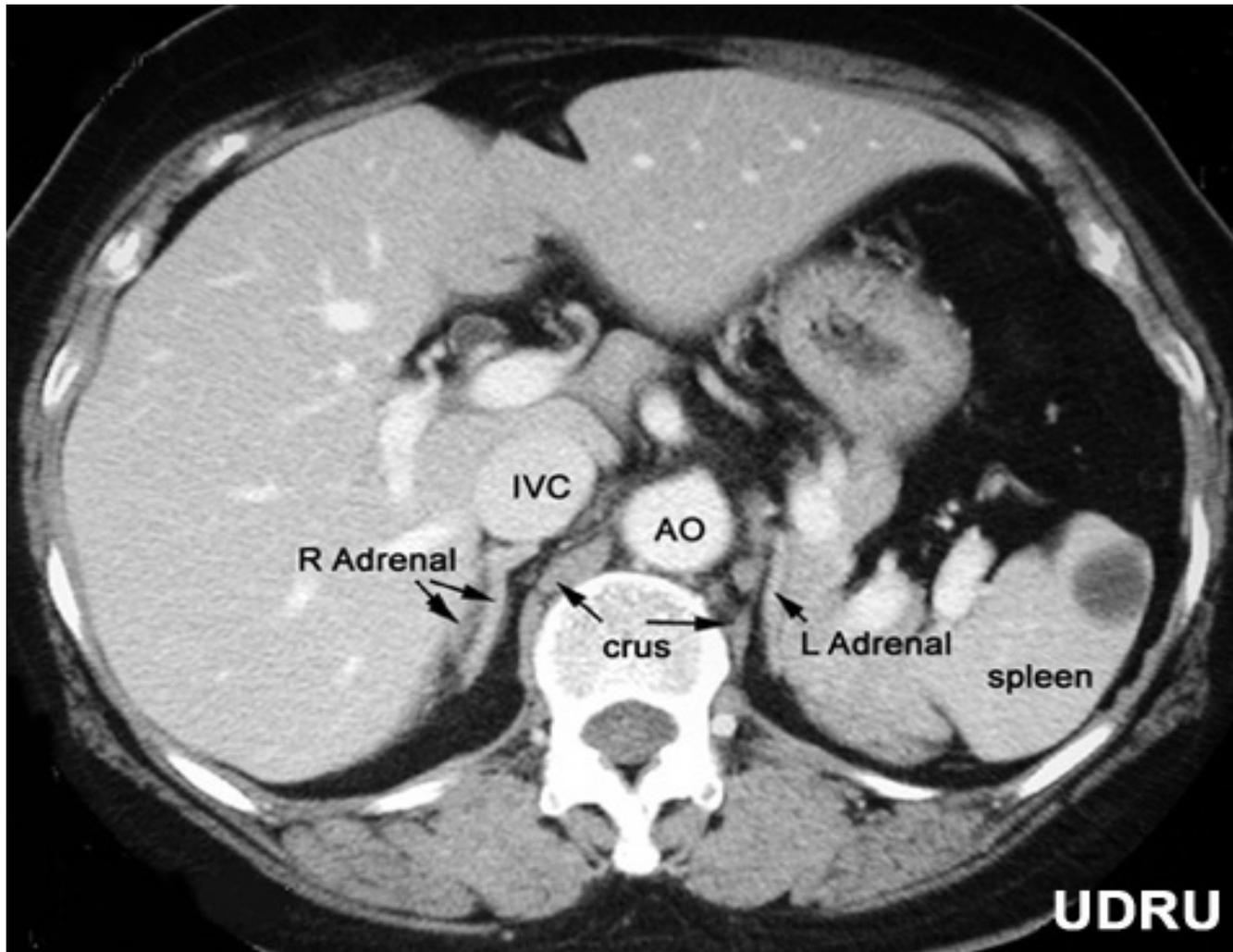


Left Adrenal Gland



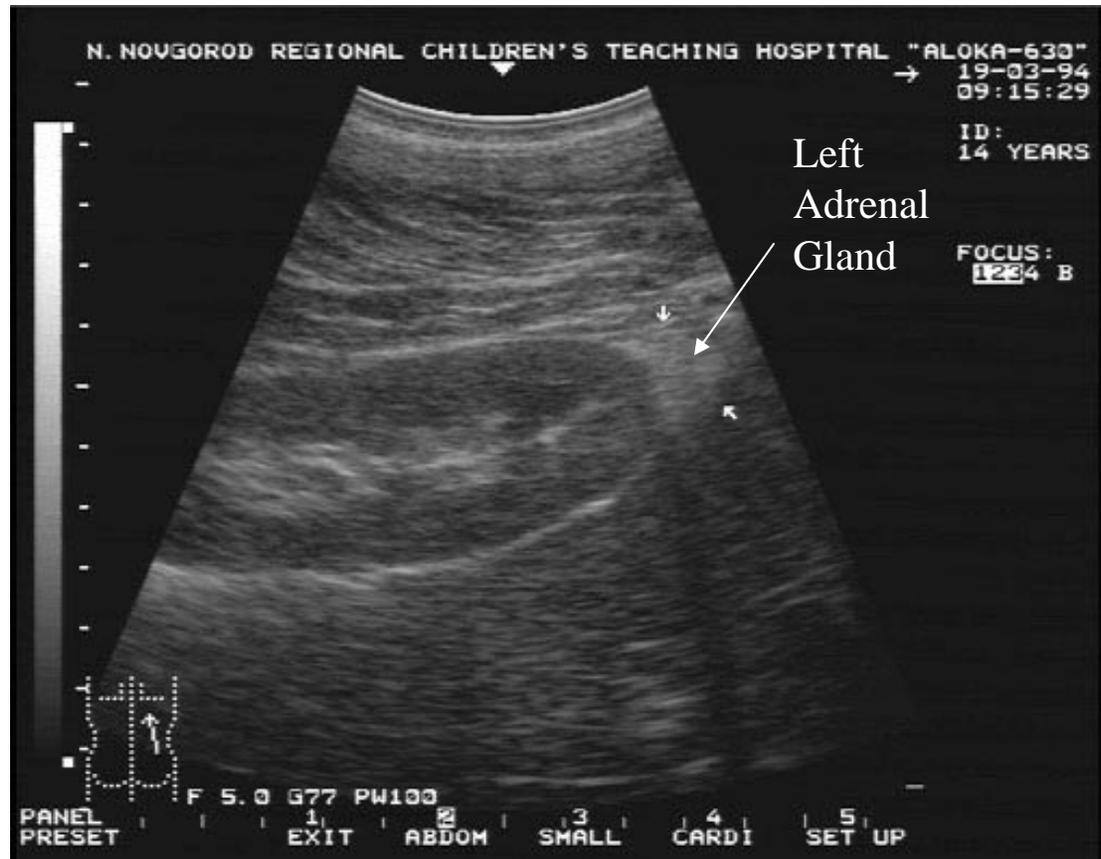


# CT Scan of normal adrenal Glands





# Ultrasound of a normal Adrenal Gland





# Diseases of the Adrenal Gland

Generally there are two main types of problems which affect the adrenal glands:

- **Tumors** – both cancerous and non-cancerous
- **Excess secretion of hormones** – causing high blood pressure or chemical imbalances in the body



# Diseases of the adrenal gland

- Tumors of the adrenal gland are rarely cancerous (10% or less)
- Symptoms are most commonly from overproduction of one of the hormones that is normally made by the gland.
- If the tumor grows large enough, the patient may have pain or discomfort in the back or side.



# Disease of the adrenal gland

- Excess production of the hormones which are normally secreted by the adrenal gland can cause a number of symptoms
  - High blood pressure
  - Heart Palpitations or rapid heart beat
  - Weight gain and irregularities in menstrual period
  - Excess hair production
  - Muscle cramps and/or low potassium levels

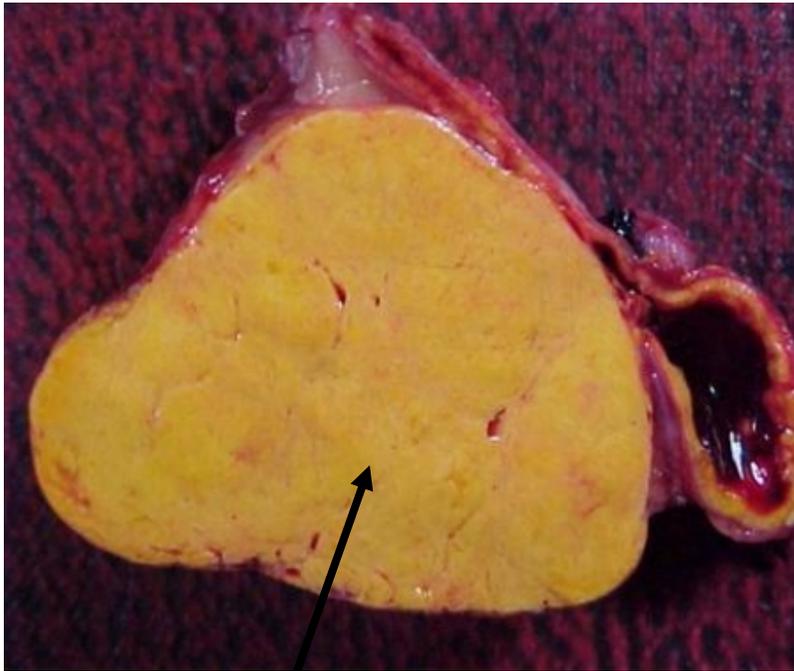


# Diseases of the adrenal gland

- Some of the tumors which produce excess adrenal hormones are:
  - **Pheochromocytoma** – a tumor which secretes adrenalin causing very high blood pressure and heart palpitations.
  - **Aldosteronoma** – a tumor which secretes aldosterone also causing high blood pressure as well as low potassium levels. This disease is known as Conn's syndrome



# Adrenal Gland Tumor



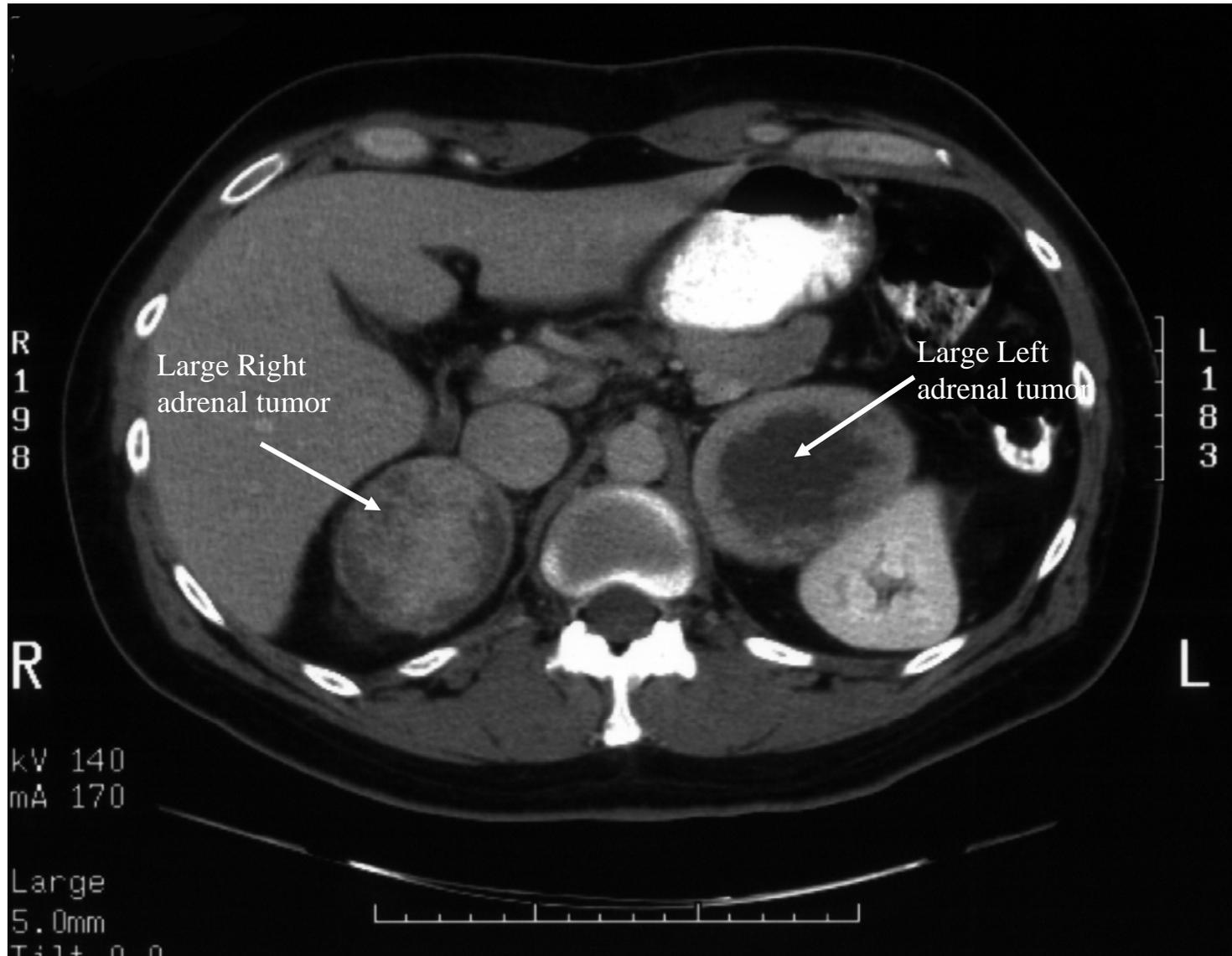
Large tumor of the right adrenal gland



Large tumor of the left adrenal gland

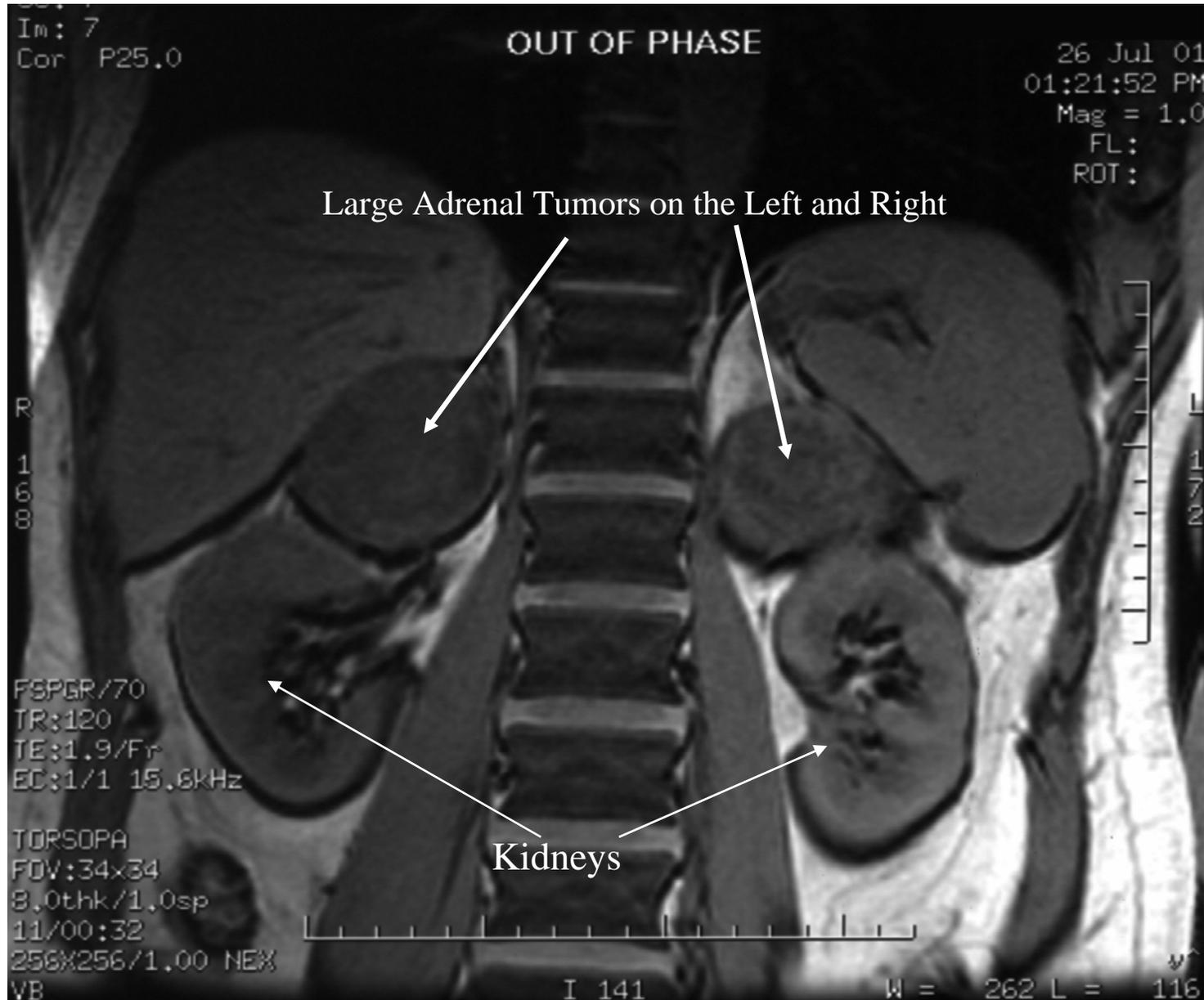


# Adrenal Tumor on CT Scan





# MRI of Adrenal Tumors





# Diseases of the Adrenal Gland

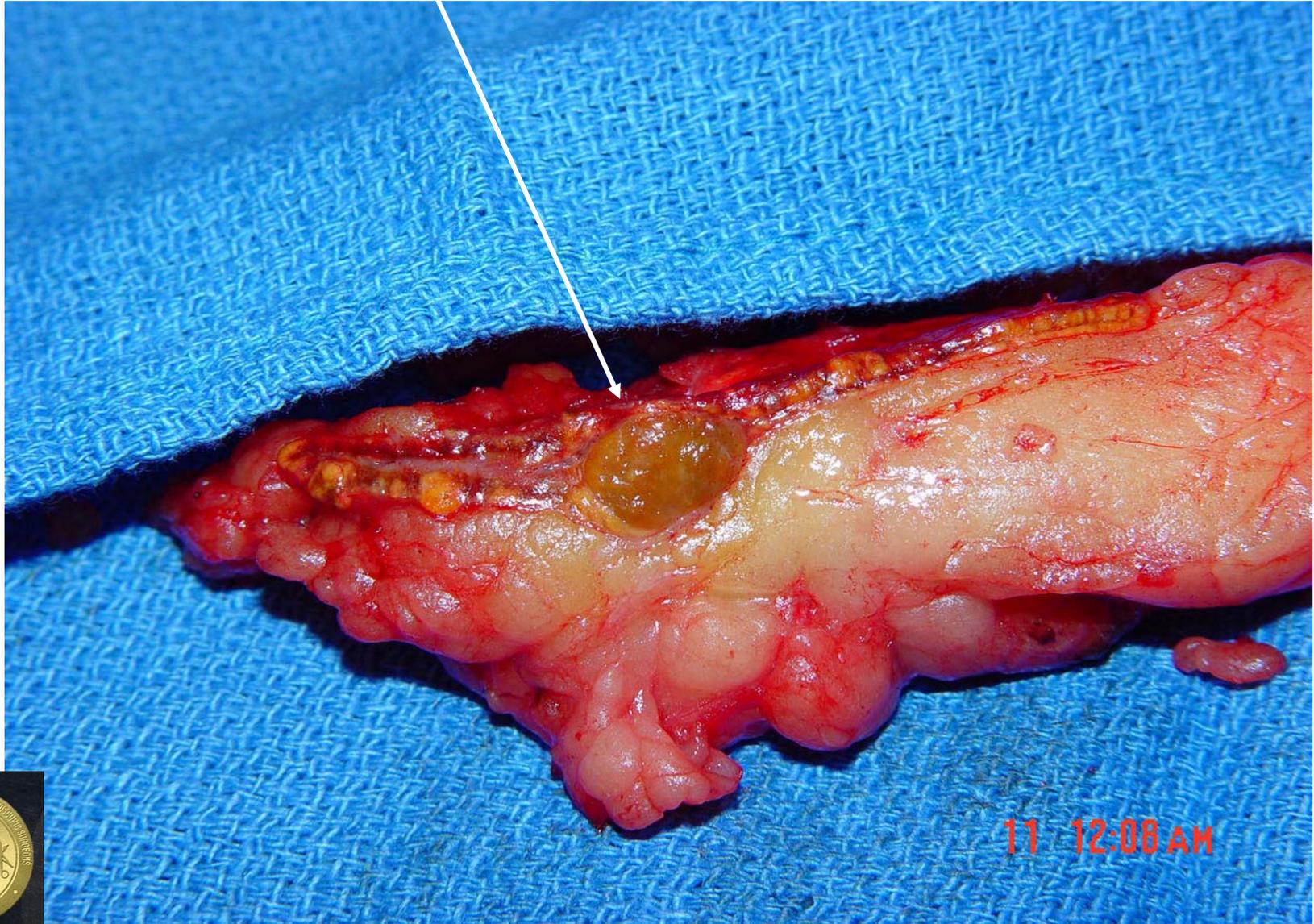
- Sometimes, a mass or tumor is found on the adrenal gland “incidentally”, when a patient has a CT scan for another reason or problem.
- These usually do not have any symptoms and usually do not release additional hormones or chemicals. As they become larger however, there is a small risk that these will become cancerous.



# Why would I need to have my adrenal gland removed?

- Patients who have tumors that produce hormones which cause symptoms or problems such as severe high blood pressure or very low potassium
- Tumors which are larger than 3-4 centimeters (about 2 inches) in size. As the tumor gets bigger, there is a greater chance of finding cancer.
- Over activity or over production of hormones (such as Cushing's syndrome) by both glands. In some circumstances, both adrenal glands will need to be removed.

Small tumor secreting the hormone aldosterone and causing high blood pressure





# What type of tests may need to be done prior to surgery?

- Special blood and urine tests are usually performed to determine which specific hormone is causing problems.
- A CT scan or MRI of the abdomen will usually identify which adrenal gland is enlarged or where the tumor is located.



# Can I live without my adrenal gland?

- Since there are two adrenal glands, the removal of one has virtually no impact. The other gland can produce the normal amount of hormones.
- If both adrenal glands are removed, long-term medication will be necessary to compensate.



# Surgery to remove the adrenal gland

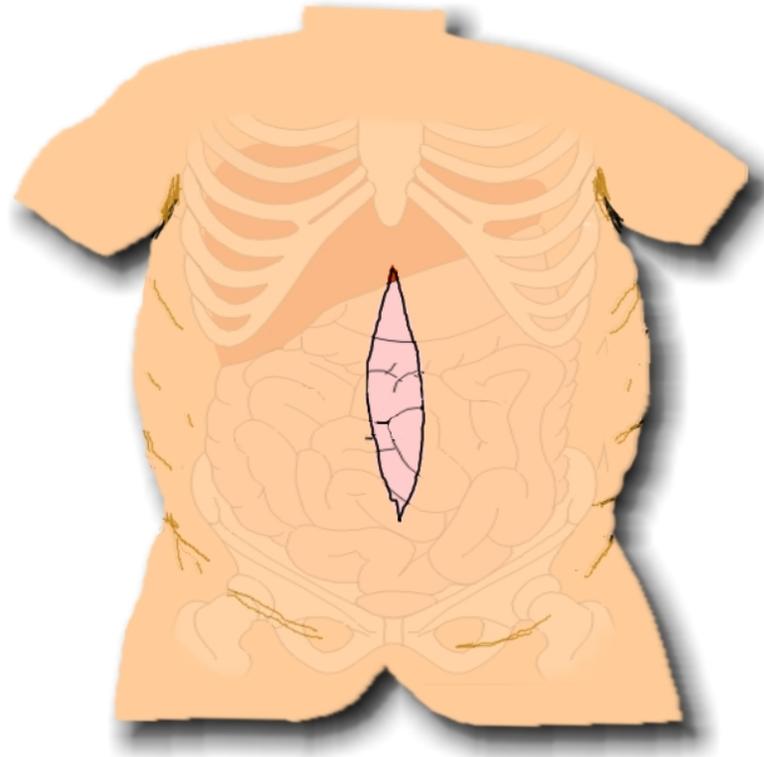
Performed in one of two ways:

- **Open** – using a large incision on the back or abdomen
- **Laparoscopic** – using small incisions in combination with a lighted telescope that allows the surgeon to “see the abdomen” on a TV screen



# Open adrenalectomy

- The incision is similar to that for a splenectomy and can either be made in the middle of the abdomen or on the side that the tumor is located just beneath the ribs
- Another method is to make an incision on the back.
- The size of the incision is approximately 8 – 15 inches



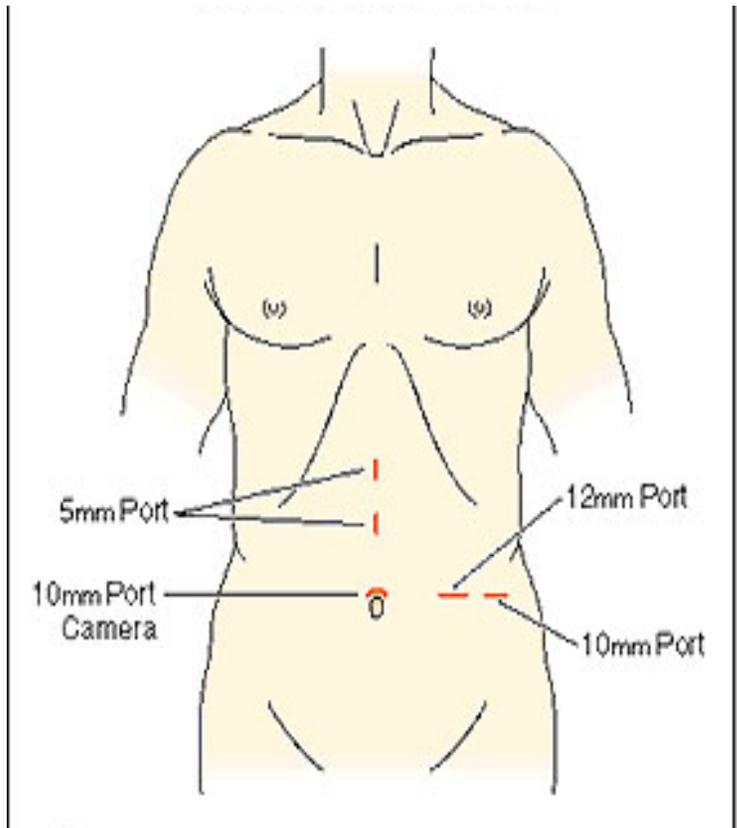


# Laparoscopic adrenalectomy

- 4 small incisions are made, each about  $\frac{3}{4}$  inch.
- The abdominal cavity is filled with carbon dioxide, to create a space to work in.
- A telescope with a video camera shows everything inside the abdomen on a television screen in the operating room.



# Laparoscopic Adrenalectomy



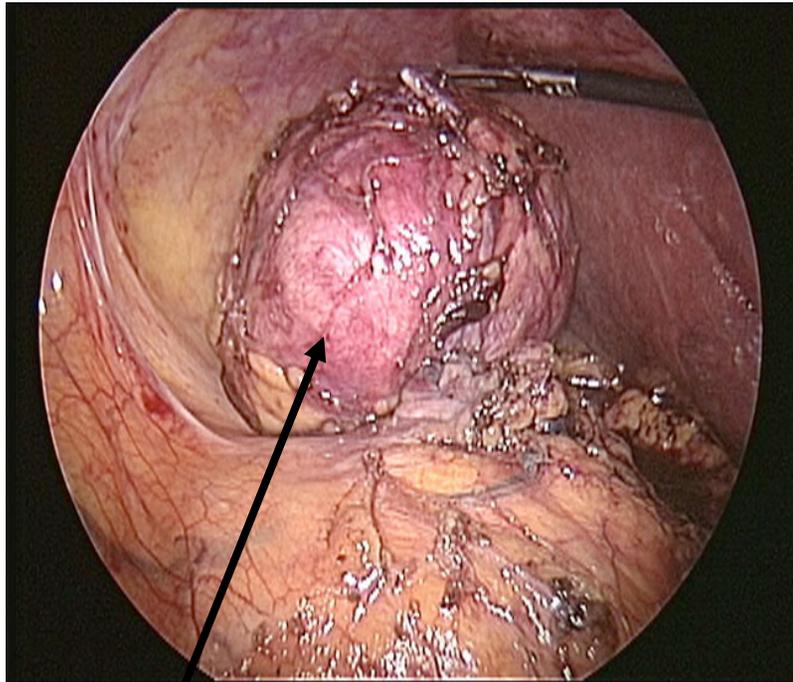
3 or 4 ½ inch incisions are made just beneath the ribs on the side which is being removed



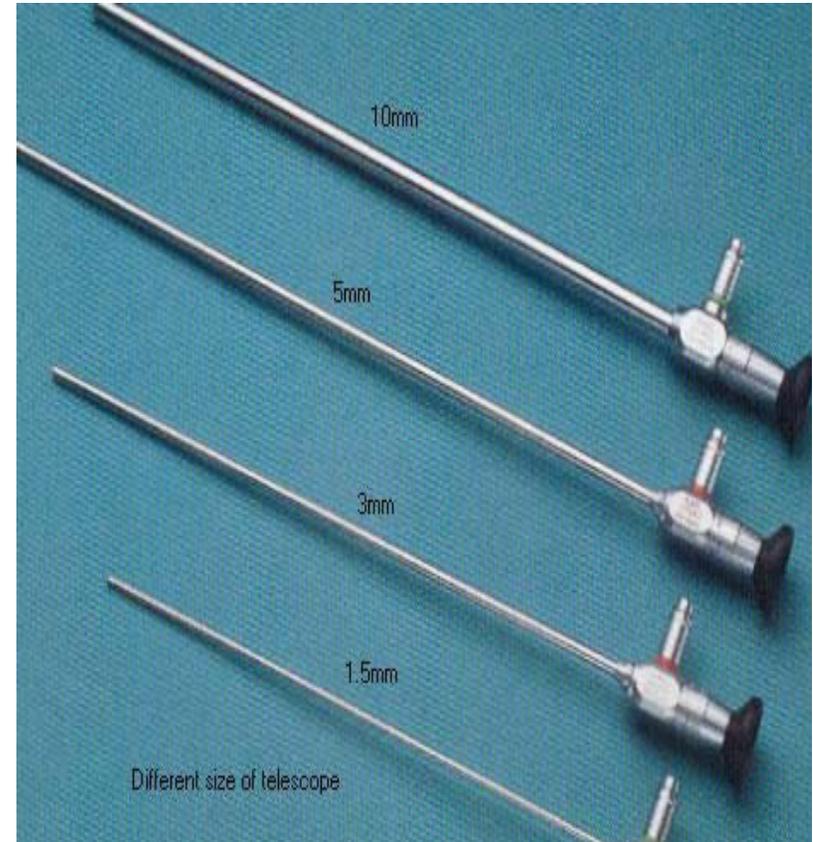
A photo of the Operating Room and the TV screens where the operation is displayed on



# Laparoscopic Adrenalectomy



Right Adrenal Tumor



Telescopes used to “see”  
inside abdomen



# What is the recovery?

- Most patients stay overnight in the hospital.
- Some patients may need to stay in the hospital a few extra days, depending on the effect that the sudden loss of extra hormones have on their body.
- Most patients can return to full physical activity in several weeks.



# What are the risks of adrenalectomy?

- Adrenal crisis – rare and usually only seen if both glands are removed at the same time. If the body does not receive enough hormone replacement (in the form of pills) after surgery, many of the body's normal functions will be affected. Symptoms can be low blood pressure, low temperature, and heart rhythm abnormalities.



# What are the risks of adrenalectomy?

- Bleeding
- Injury to the kidney, bowel, pancreas, liver, spleen, or blood vessels
- Infection
- Hernia (bulge) at one of the incision sites
- Numbness in the incision
- Pain
- Blood clot in the veins of the leg or in the lung
- Death



# Who performs laparoscopic splenectomy and adrenalectomy?

- Not all surgeons are trained to perform these procedures.
- It is important that your surgeon be familiar with this type of operation to minimize the problems that can occur. Make sure to ask your surgeon if they have special training and how many of these procedures that they have done.