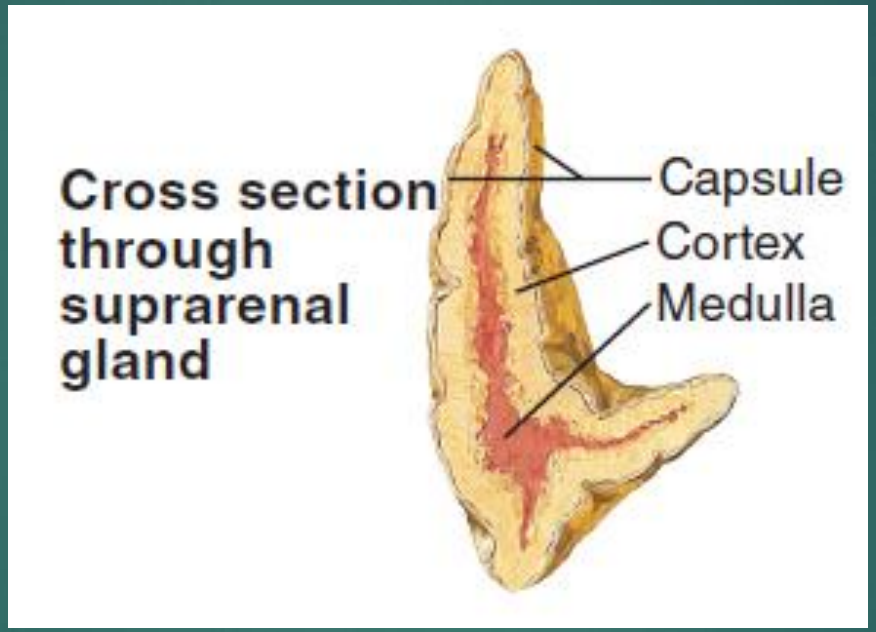
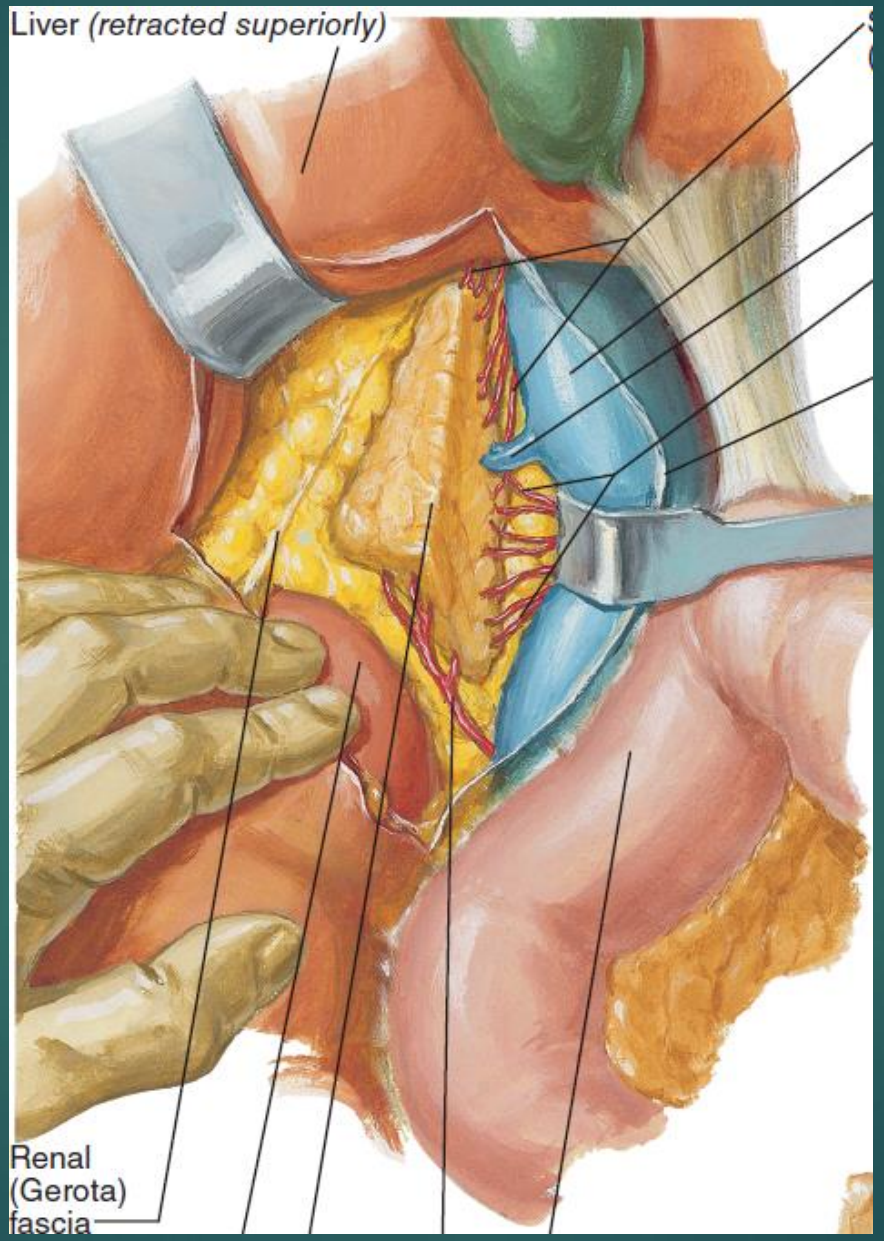
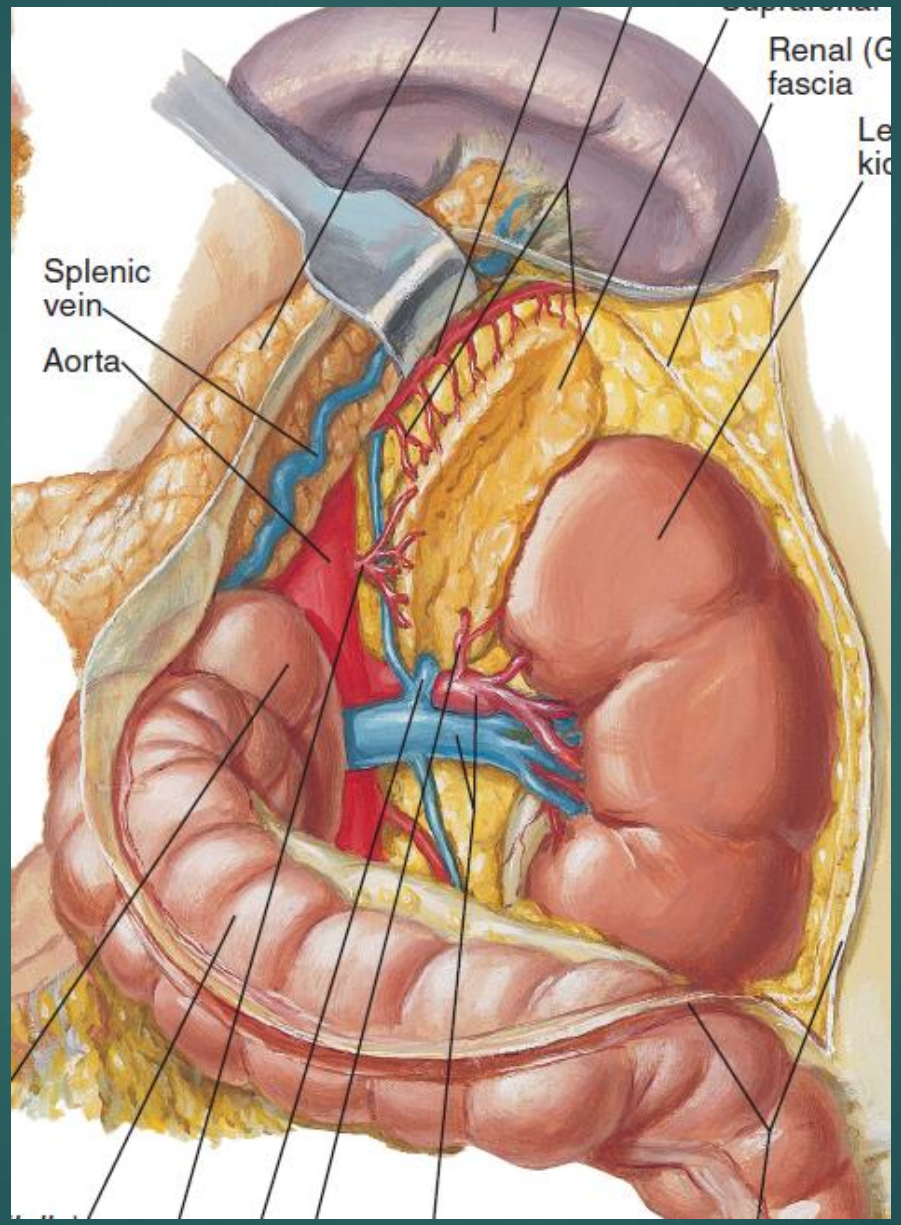
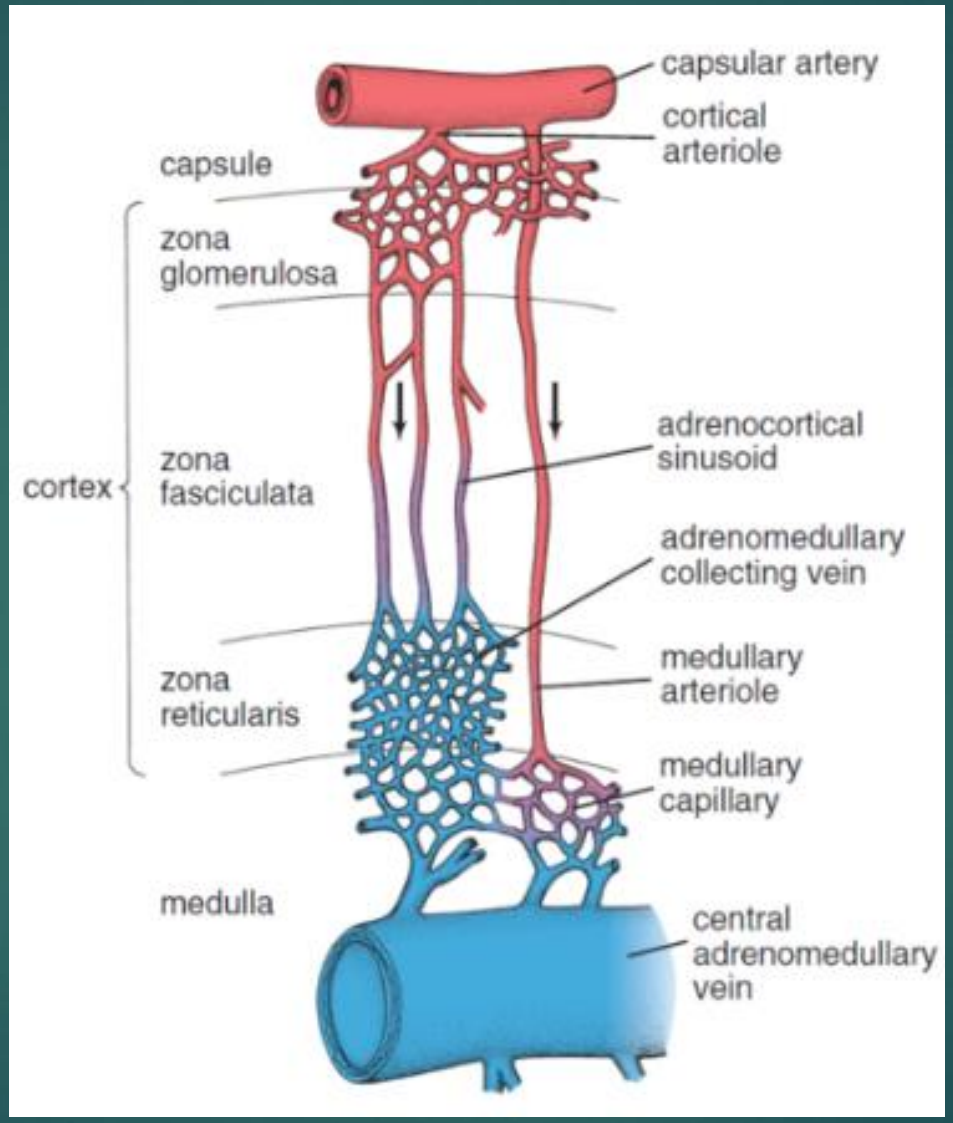
# Surgical Approaches to the Adrenal Gland


Cross section through suprarenal gland
Capsule
Cortex
Medulla


Liver (retracted superiorly)
Renal
(Gerota)
fascia


Renal (G
fascia
Le
kid
Splenic
vein
Aorta


capsular artery
cortical arteriole
capsule
zona glomerulosa
cortex
zona fasciculata
adrenocortical sinusoid
adrenomedullary collecting vein
zona reticularis
medullary arteriole
medullary capillary
medulla
central adrenomedullary vein

# OPERATIVE APPROACHES

- Transabdominally
- Retroperitoneally

# Selection of operative approach

## Surgeon expertise

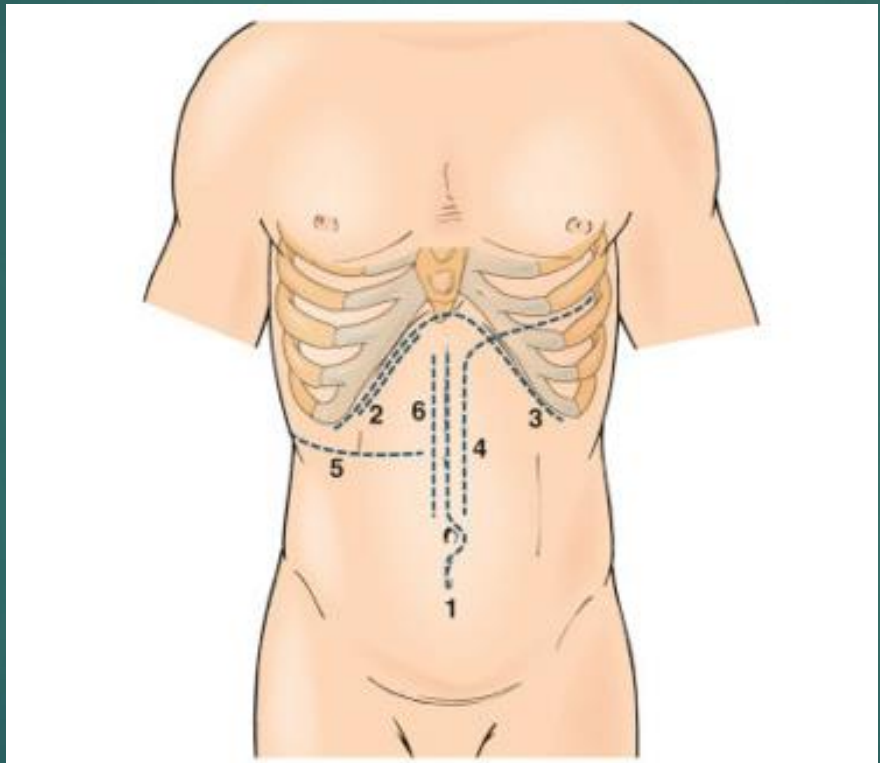
When the surgeon is experienced with more than one approach,

- large or malignant tumors
- bilateral tumors
- extensive prior abdominal surgeries
- patient body habitus

# Open Vs MIS?

- Primary adrenal malignancy of any size (eg, adrenal cortical carcinoma, malignant pheochromocytoma).
- Adrenal mass invading surrounding structures (eg, liver, kidney, inferior vena cava).
- Adrenal mass suspicious but not confirmed as a primary adrenal malignancy (eg, >6 cm, irregular margins, hemorrhage or central necrosis, hypervascular).
- Extensive prior upper abdominal or retroperitoneal procedures that preclude a minimally invasive surgical (MIS) approach.
- Concomitant procedures (eg, hepatic resection) not amenable to laparoscopic approach.

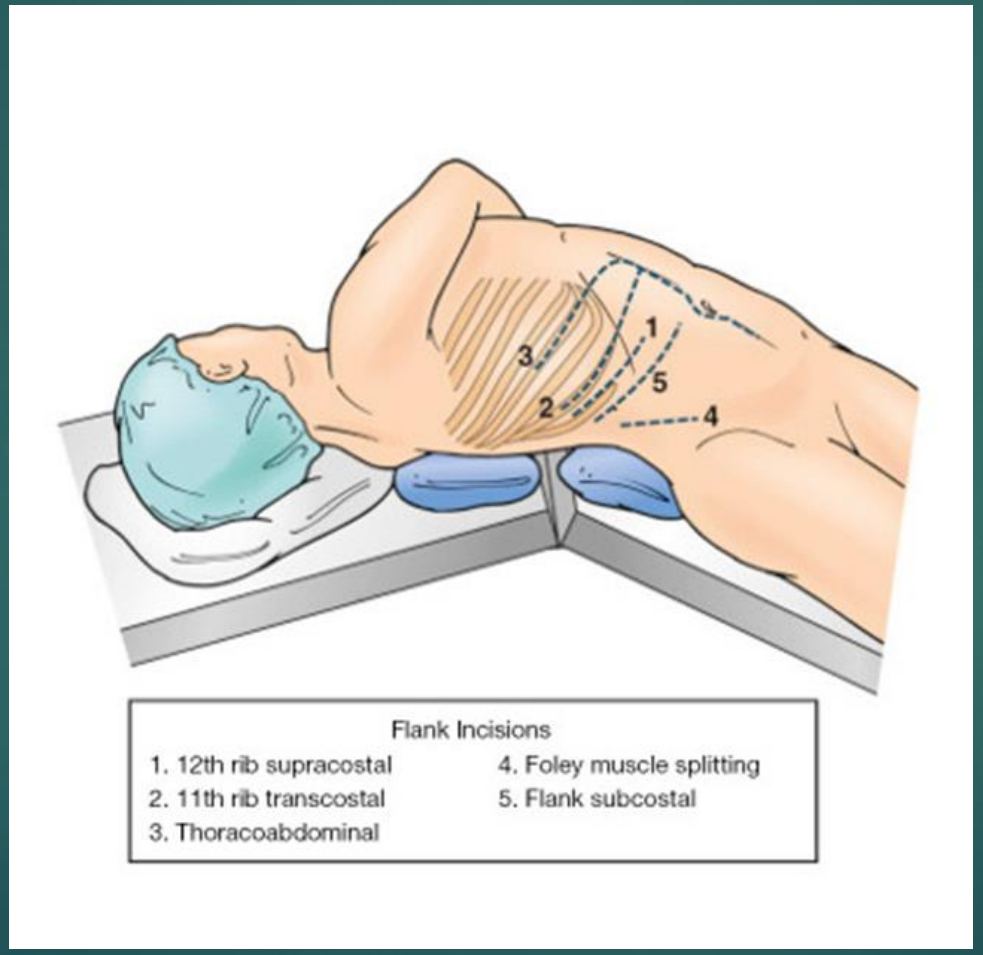
# Open Transabdominal Adrenalectomy




Anterior Incisions

1. Midline transperitoneal
2. Subcostal
3. Chevron
4. Modified thoracoabdominal
5. Transverse
6. Paramedian

# Open Retroperitoneal Adrenalectomy



# Adrenocortical carcinoma

In the United States, open adrenalectomy with removal of adjacent lymph nodes is recommended regardless of size.

- National Comprehensive Cancer Network (NCCN) American Association of Clinical Endocrinologists (AACE), and American Association of Endocrine Surgeons (AAES)

In Europe, laparoscopic adrenalectomy is performed for stage I or II ACC with a diameter<10 cm.

- European Society of Endocrine Surgeons

Data on the safety and efficacy of MIS for suspected ACC are inconsistent

no significant differences in recurrence rates or complications between laparoscopic and open adrenalectomy among 517 patients undergoing surgery for adrenal malignancy

Sautter AE, et al. Am Surg. 2016

# Pheochromocytoma

laparoscopically or robotically when safe and feasible

- convert to open surgery in case of intraoperative bleeding (pheochromocytomas are hypervascular lesions) or capsular violation (risk of hypertensive crisis)

## Open adrenalectomy

- large (>6 cm)
- invasive pheochromocytomas
- paragangliomas

# Intraoperative Complications

**ACCESS RELATED**
Abdominal wall hemorrhage
Cutaneous nerve injury
Visceral injury by Veress needle or trocar

**HEMORRHAGE**
Inferior vena cava or aorta
Adrenal vein
Lumbar vein
Hepatic vein
Remnant adrenal gland after partial adrenalectomy

**ISCHEMIA**
Ligation of renal artery or vein
Ligation of superior mesenteric artery and vein

**INJURY TO NEIGHBORING ORGANS AS A RESULT OF THERMAL ENERGY OR INCORRECT PLANE OF DISSECTION**
Lung—pneumothorax
Pancreas
Liver
Spleen
Stomach and bowel, especially duodenum
Kidney

**HEMODYNAMIC INSTABILITY**
Pheochromocytoma

# Postoperative Complications

**PRIMARY ALDOSTERONISM**

Hypokalemia: secondary to continued potassium loss immediately postoperative

Hyperkalemia: secondary to failure of contralateral adrenal to secrete aldosterone

**CUSHING SYNDROME**

Inadequate steroid replacement leading to hypocorticism

Fracture secondary to osteoporosis

Hyperglycemia

Poor wound healing

Increased risk of infections

**PHEOCHROMOCYTOMA**

Hypotension secondary to $\alpha$-adrenergic blockade after tumor removal

**GENERIC COMPLICATIONS**

Hemorrhage

Pneumothorax

Pancreatitis

Pneumonia

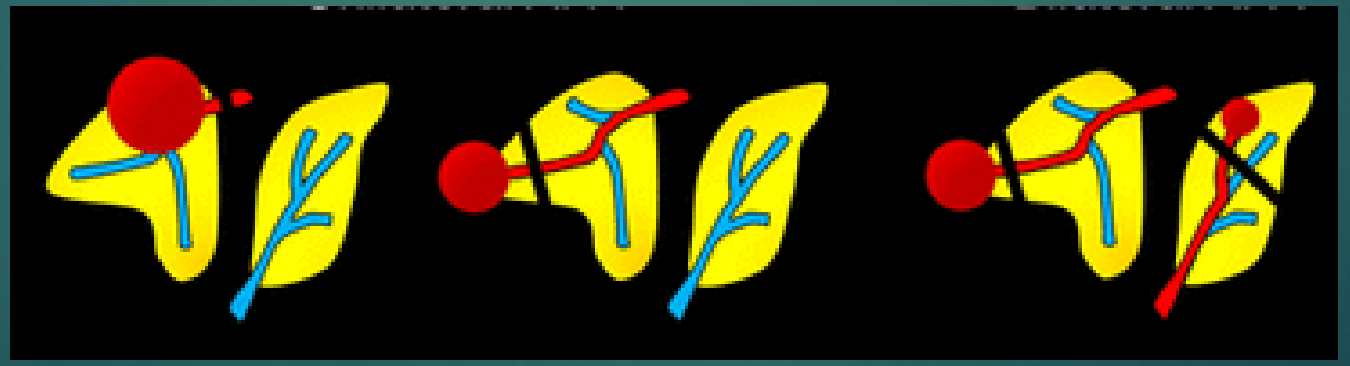
Prolonged ileus

Intra-abdominal collections

# Partial Adrenalectomy

no established consensus or guidelines

- lesions <3 cm that are located anteriorly or laterally in the adrenal gland (to preserve the adrenal vein)



The amount of adrenal tissue that must be left behind after partial adrenalectomy to avoid insufficiency **is not known**.

- at least a third of the adrenal gland should be preserved
- a 3- to 5-mm margin is recommended.

The overall recurrence rate was 8% (95% CI: 0.05–0.12)

- the least in the retroperitoneoscopic group 1% (95% CI: 0–0.04) and Conn's syndrome group 2% (95% CI: 0.01–0.05)
- highest in open group 15% (95% CI: 0.07–0.28) and Pheochromocytoma group 10% (95% CI: 0.07–0.16)

Steroid free rate were 85% (95% CI: 0.78–0.9)

- best in the Conn's syndrome group 97% (95% CI: 0.85–0.99) and laparoscopic group 88% (95% CI: 0.75–0.95)

Nagaraja V et al. Int J Surg. 2015

- Bilateral hereditary pheochromocytoma
  - Endocrine syndromes MEN I and II
  - von Hippel-Lindau syndrome
  - Neurofibromatosis type 1
  - Hereditary pheochromocytoma-paraganglioma syndrome (PGL)
  - Unilateral pheochromocytoma in documented genetic cases
- Primary aldosteronism resulting from unilateral adrenal adenoma with the opposite normal adrenal gland
- Unilateral adrenal adenoma in Cushing syndrome
- Pseudocyst or adrenal endothelial cyst

# Thanks For Your Attention