



### **Renal Module** Suprarenal Gland (SGD)



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# Motto Vision ;The Dream/Tomorrow



- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

## Prof. Umar's Model of Teaching Strategy Self Directed Learning Assessment Program

Objectives : To cultivate critical thinking, analytical reasoning, and problem-solving competencies.

To instill a culture of self-directed learning, fostering lifelong learning habits and autonomy.

How to Assess?

➤Ten randomly selected students will be evaluated within the first 10 minutes of the lecture through 10 multiple-choice questions (MCQs) based on the PowerPoint presentation shared on Students Official WhatsApp group, one day before the teaching session.

➤ The number of MCQs from the components of the lecture will follow the guidelines outlined in the Prof. Umar model of Integrated Lecture.

Component	Core	Horizontal	Vertical	Spiral
of LGIS	Knowledge	Integration	Integration	Integration
No. of MCQs	6-7	1-2	1	1





# Learning objectives

- Describe the location & visceral relations of right & left suprarenal glands
- Discuss the neuro-vasculature of supra-renal glands
- Discuss the related clinical
- Correlate Physiology and Biochemistry (Horizontal Integration)
- Correlate clinical aspects / clinical conditions (Vertical integration)
- Able to focus on the provision of curative and preventive health care measures
- Practice principles of Bioethics with professionalism/ communication skills
- Apply strategic use of AI in healthcare
- Able to read the relevant research article
- Know how to use HEC Digital Library

### INTERACTIVE SESSION

# **ADDISON'S DISEASE**



Is a rare, chronic endocrine system disorder in which the adrenal glands do not produce sufficient steroid hormones (glucocorticoids and mineralocorticoids)



### **Anatomical location**



### **Development of the Adrenal Glands**

The two parts of the adrenal gland i.e. the cortex and the medulla develop from two different origins.

### > Cortex;

- is mesodermal in origin;
- develops from the celomic epithelium of the posterior abdominal wall.

### > Medulla;

- is ectodermal in origin;
- develops from the neural crest cells.





## **Adrenal gland**

#### LOCATION

- ✓ paired , retroperitoneal
- ✓ related to upper pole of kidney
- Yellowish in colour

#### SHAPE AND MEASUREMENTS

Shape: Each gland is flattened A-P 1. RT. : pyramidal in shape 2LT.: crescentric in shape like

#### Measurements:

50 mm. 30 mm. 10 mm. About 5 g.



At birth the gland is 1/3 of the size of kidney, in adults it is only 1/30<sup>th</sup> of the size of kidney

a. Gross features:

- · Right adrenal gland has an
  - o Apex
  - o Base
  - Three borders (anterior, medial, lateral)
  - o Two surfaces (anterior and posterior)
- Left adrenal gland has
  - o Two ends (upper and lower)
  - o Two borders (medial and lateral)
  - o Two surfaces (anterior and posterior)





Adrenal gland





Right Adrenal Gland		Left Adrenal Gland		
Anterior	Posterior	Anterior	Posterior	
<ul> <li>Inferior vena cava</li> <li>Right lobe of the liver</li> </ul>	<ul> <li>Right crus of the diaphragm</li> </ul>	<ul><li>Stomach</li><li>Pancreas</li><li>Spleen</li></ul>	<ul> <li>Left crus of the diaphragm</li> </ul>	



14 5 1 C 1 S C



### Arteries:

The arteries supplying each gland are three in number:

 Superior suprarenal artery,
 Middle suprarenal artery, and
 Inferior suprarenal

artery.

# **Blood supply**



# Con.

Respectively each one arises from;

- inferior phrenic artery,
- <u>abdominal</u>
   <u>aorta</u>, and
   <u>renal artery</u>,





### Veins:

A single vein emerges from the hilum of each gland and drains into the inferior vena cava on the right and the left renal vein on the left.

# **Blood supply**



### □ Nerve Supply:

- Preganglionic sympathetic fibers
- derived from the splanchnic nerves supply the glands.
- Most of the nerves end in the medulla of the gland.





- <u>Arteries</u>: Each gland receives branches from three main arteries:
  - Inferior phrenic
  - Aorta
  - Renal artery.
- Veins: A single vein emerges from the hilum of each gland and drains into the Inferior vena cava on the right & Renal vein on the left.
- Lymph Drainage: The lymph drains into the lateral aortic nodes.



 Nerve Supply: Preganglionic sympathetic fibers derived from the splanchnic nerves. Most of the nerves end in the medulla of the gland.

# Physiology

- The <u>cortex</u> of the suprarenal glands secretes hormones that include:
  - Mineral corticoids , which are concerned with the control of fluid and electrolyte balance
  - Glucocorticoids, which are concerned with the control of the metabolism of carbohydrates, fats, and proteins
  - Small amounts of sex hormones, which probably play a role in the prepubertal development of the sex organs.
- The <u>medulla</u> of the suprarenal glands secretes the catecholamines: epinephrine and norepinephrine

### **Adrenal gland**

### Adrenalectomy (removal of the adrenal glands)

Rt. suprarenal vein must be ligated before manipulating the gland

1. Short ,wide

2. To prevent surge of catecholamines to the circulation.

surgical removal of Lt. gland is easier because the identification & clamping of the left suprarenal vein is easy

Rt. gland is more difficult to approach than the left because part of it lies posterior to IVC



# Adrenal gland Anterior Approach for Left Adrenalectomy



# Thoracoabdominal Approach for Adrenalectomy



# Laparoscopic Adrenelectomy



Con.

- The suprarenal gland of the fetus is 10-20 times larger than the adult glands relative to the body weight, and are large compared with the kidneys. This is because of the extensive size of the fetal cortex. The medulla remains relatively small until after birth.
- The suprarenal glands rapidly become smaller during the first 2-3 weeks after birth, due to the rapid regression of the fetal cortex.
- Its involution is largely completed in the first year of life.
- During the process of involution, the cortex is friable and susceptible to trauma at birth leading to severe hemorrhage.

Con.

- Congenital adrenal hyperplasia (CAH):
- An abnormal increase in the cortical cells results in excessive androgen production; during the fetal period.
- In females, it may lead to <u>musculization of external</u> <u>genitalia</u> and <u>enlargement of clitoris</u>.
- In males, it may remain <u>undetected</u> in early infancy.
- Later in childhood, in both sexes, androgen excess may lead to <u>rapid growth and accelerated skeletal</u> <u>maturation</u>.

# Vertical Integration Applied anatomy

- Addison's disease: deficiency of mineralocorticoids
- Conn's syndrome: adrenal hyperplasia with ecexssive mineralocorticoids secretion.

### Conn's disease HYPERALDOSTERONISM

usually caused by adrenal tumor

- Na and water retention
- ≻K+ (hypokalemia)
- Hypertension







# Cushing's Syndrome



Michael Santoro and his twin sister, Paula, who had Cushing's Syndrome.



**Spiral Integration** 

# **Biomedical Ethics**

# **Communication Skills**

### Interpersonal Skills in the Workplace

A ativa Listaning



Affirming the speaker as they're talking and asking clarifying

Active Listening	questions when they're done
Collaboration	Facilitating a brainstorm session with teammates to solve a problem together
Empathy	Regularly checking in with coworkers and offering space to tal about anything that's challenging them
Respect	Fostering an inclusive work environment by listening to everyone's contributions and opinions

### Spiral Integration Family Medicine & Professionalism ADDISON'S DISEASE

Is a rare, chronic endocrine system disorder in which the adrenal glands do not produce sufficient steroid hormones (glucocorticoids and mineralocorticoids)











	Acute Adrenal Insufficiency	Chronic Adrenal Insufficiency	Chronic Adrenal Insufficiency
	(Adrenal Crisis)	(Primary)	(Secondary)
/	<ul> <li>Replace cortisol: IV hydrocortisone</li> <li>Replace aldosterone: IV fluids</li> <li>Correct hypoglycemia: IV D50</li> <li>Correct electrolytes</li> <li>Hypotension/Shock: IV fluids, hydrocortisone, vasopressors, etc.</li> </ul>	<ul> <li>Replace cortisol: Glucocorticoids (prednisone, hydrocortisone, etc.)</li> <li>Replace aldosterone: Fludrocortisone</li> <li>Replace androgens: DHEA</li> </ul>	<ul> <li>Replace cortisol: Glucocorticoids (prednisone, hydrocortisone, etc.)</li> <li>Replace androgens: DHEA</li> <li>Reminder: Aldosterone not affected in secondary</li> </ul>

#### **Spiral Integration**







TOXICOLOGIC PATHOLOGY, vol 29, no 1, pp 41-48, 2001 Copyright © 2001 by the Society of Toxicologic Pathologists

**Research Article** 

#### Adrenal Gland: Structure, Function, and Mechanisms of Toxicity

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#### ABSTRACT

The adrenal gland is one of the most common endocrine organs affected by chemically induced lesions. In the adrenal cortex, lesions are more frequent in the zona fasciculata and reticularis than in the zona glomerulosa. The adrenal cortex produces steroid hormones with a 17-carbon nucleus following a series of hydroxylation reactions that occur in the mitochondria and endoplasmic reticulum. Toxic agents for the adrenal cortex include short-chain aliphatic compounds, lipidosis inducers, amphiphilic compounds, natural and synthetic steroids, and chemicals that affect hydroxylation. Morphologic evaluation of cortical lesions provides insight into the sites of inhibition of steroidogenesis. The adrenal cortex response to injury is varied. Degeneration (vacuolar and granular), necrosis, and hemorrhage are common findings of acute injury. In contrast, chronic reparative processes are typically atrophy, fibrosis, and nodular hyperplasia. Chemically induced proliferative lesions are uncommon in the adrenal cortex. The adrenal medulla contains chromaffin cells (that produce epinephrine, norepinephrine, chromogranin, and neuropeptides) and ganglion cells. Proliferative lesions of the medulla are common in the rat and include diffuse or nodular hyperplasia and benign and malignant pheochromocytoma. Mechanisms of chromaffin cell proliferation in rats include excess growth hormone or prolactin, stimulation of cholinergic nerves, and diet-induced hypercalcemia. There often are species specificity and age dependence in the development of chemically induced tivate adrenal lesions that should be considered when interpreting toxicity data.

Keywords. Adrenal cortex; adrenal medulla; corticosteroid biosynthesis; chromaffin cell; degeneration; toxicology

**Spiral Integration** 

## Artificial Intelligence



- Al-can potentially aid in enhancing diagnostic accuracy and efficiency
- AI-powered decision support system can also help clinicians in selecting appropriate treatment modalities
- Al-driven predictive models may help anticipate the risk of complications and recurrence in susceptible populations

# **How To Access Digital Library**

### Steps to Access HEC Digital Library

- 1. Go to the website of HEC National Digital Library.
- 2. On Home Page, click on the INSTITUTES.
- 3. A page will appear showing the universities from Public and Private Sector and other Institutes which have access to HEC National Digital Library HNDL.
- 4. Select your desired Institute.
- 5. A page will appear showing the resources of the institution
- 6. Journals and Researches will appear
- 7. You can find a Journal by clicking on JOURNALS AND DATABASE and enter a keyword to search for your desired journal.

# Video



