SUPRARENAL GLANDS

I. INTRODUCTION

The suprarenal glands or adrenal glands are paired endocrine glands. They are located in the retroperitoneal space at the upper pole of the kidneys. It is an organ essential to life as it ensures the secretion of cortisol and catecholamine.

Their dysfunction is the cause of several life-threatening diseases such as Addison's disease, Cushing's syndrome, Conn's disease, hyperandrogenism's syndroms...

II. DESCRIPTIVE ANATOMY

A- SITUATION

The right suprarenal gland surmounts the upper pole of the right kidney. The left suprarenal gland drapes over the medial border of the left kidney above the hilum and is situated lower down. The suprarenal glands are surrounded by the perinephric fat and enclosed in the renal fascia, though a thin septum separates each gland from its associated kidney.

B- SHAPE

The adrenal glands are somewhat asymmetrical, the right gland is shaped like a pyramid whereas the left suprarenal gland is crescentic in shape. They are rather yellowish in colour and have a soft texture.

Each gland has three faces: anterior, posterior and renal as well as two borders: superior and medial. The anterior face contains the hilum in its centre. Therefore, the hilum divides this face into three surfaces: medial, lateral and inferior. This subdivision is useful for studying the anatomical relations of the suprarenal glands. The posterior face is convex and the renal is concave.

C- DIMENSIONS

Each suprarenal gland measures approximately five centimetres in height, about three centimetres in width and 1 centimetre in thickness. It weighs nearly five grams.

III. STRUCTURE

To the naked eye a section across the suprarenal resembles a sandwich. Two layers of cortex (the bread) enclose a much thinner layer of medulla (the meat) between them. (Figure 1)

In places there is no medulla, and the two layers of cortex then meet each other. The whole sandwich is covered by a kind of cling film which is the connective tissue capsule. The cortex is immediately beneath the capsule.

A- SUPRARENAL CORTEX

. The cortex, whose principal products are cortisol, aldosterone, androgens and related hormones, consists of three layers or zones. Immediately beneath the connective tissue capsule is

the zona glomerulosa, with small rounded groups of cells, produces aldosterone and participate in the renin angiotensin system. The second layer is the largest of the three, the zona fasciculata, consisting of parallel rows of pale-staining vacuolated cells with a high cholesterol content, produces cortisol. The innermost zona reticularis is a network of smaller and darker-staining cells, it secretes androgens.

The adrenal cortex is controlled by ACTH secreted by the anterior pituitary gland. Addison disease is a cortisol secretion failure whereas Cushing syndrome reflects a hyperfunction of the suprarenal cortex.

B- SUPRARENAL MEDULLA

The rather small central medulla has larger cells secreting the catecholamines adrenaline (80%) and noradrenaline (20%) and some dopamine. Many of the medullary cells exhibit the chromaffin reaction: they contain fine cytoplasmic granules (the catecholamine precursors) which are coloured brown by chromium salts. Dilated capillaries are usually prominent in the medulla but not in the cortex; as in any endocrine tissue, many are present but are collapsed in histological sections.

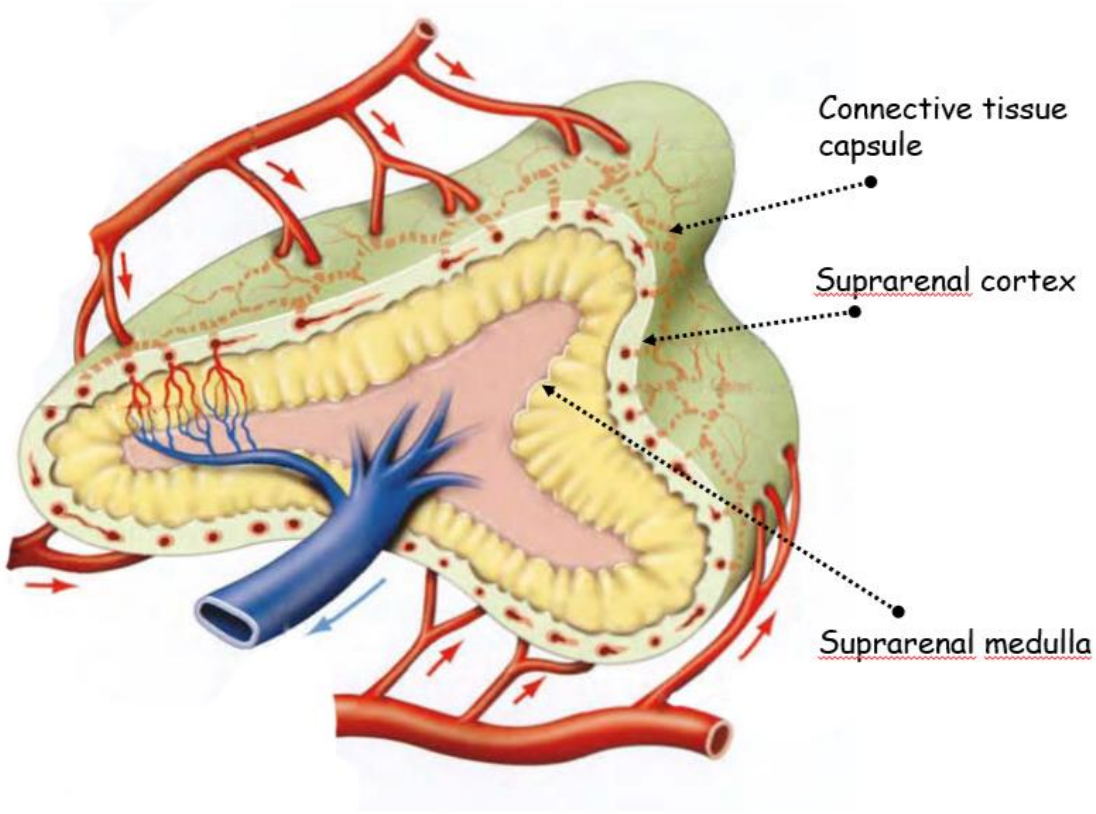

Figure 1: Figure showing the structure of suprarenal gland (From KAMINA)

IV. ANATOMICAL RELATIONS

The suprarenal gland is a thoracoabdominal and asymmetrical organ. Therefore, its anatomical relations differ from right to left and are numerous.

A- RIGHT SUPRARENAL GLAND

The medial surface of its anterior face is in contact with the inferior vena cava, the lateral surface of the same face adheres to the right triangular ligament of the liver and its lower surface is in contact with the liver and duodenum.

The posterior face adheres to the diaphragm, pleura and the two last ribs.

The renal face surmounts the upper pole of the right kidney.

The superior border lies under the diaphragm when the medial border is to the right of the celiac plexus, the right inferior phrenic artery and the right crus of the diaphragm.

B- LEFT SUPRARENAL GLAND

The upper pole of its anterior surface is covered with peritoneum of the lesser sac and forms a part of the stomach bed and the lower pole is covered in front by the body of the pancreas, the splenic artery and the lower pole of the spleen.

The posterior face adheres to the left crus of the diaphragm.

The renal face drapes over the medial border of the left kidney above the hilum.

The superior border lies under the diaphragm when the medial border is to the left of the celiac plexus, the left inferior phrenic artery and the aorta.

V. BLOOD SUPPLY; NERVE SUPPLY AND LYMPH DRAINAGE

A- ARTERIES

The blood supply of the adrenal gland is arranged in three levels.

The superior suprarenal arteries are several small branches provided from the inferior phrenic artery. The middle suprarenal arteries arise from the aorta and the inferior suprarenal arteries come from the renal artery.

B- VEINS

The venous plexus of the medulla drains into one central vein.

The central vein emerges from the hilum to become the right and left suprarenal veins.

The right suprarenal vein is only a few millimetres long and enters the vena cava.

The left suprarenal vein is longer and enters the left renal vein. It anastomoses with the left inferior phrenic vein, creating a renal suprarenal shunt.

C- LYMPH DRAINAGE

The main nerve supply is ensured by myelinated preganglionic sympathetic fibres from the splanchnic nerves via the celiac and renal plexuses. Although, cortical control is not neural but by ACTH from the anterior pituitary.

D- NERVES

The lymph drainage of the adrenal gland is ensured by the para-aortic nodes. The para-aortic nodes are, mainly, arranged in four groups.

The pre-aortic group lies in front of the aorta and contains the celiac, superior and inferior mesenteric nodes. It drains the gastrointestinal viscera as well.

The lateral aortic group is adjacent to the aorta at the edge of the psoas major muscle. It drains the pelvic organ also.

The retroaortic group is posterior to the aorta.

The right para-aortic nodes are partly anterior to the vena cava near the termination of the renal vein and partly behind it in front of the origin of psoas major muscle.

VI. SURGICAL APPROACH

For suprarenalectomy (adrenalectomy) the glands are usually approached from the front. The right gland is exposed by incising the peritoneum over the upper pole of the kidney. On the left the stomach and spleen are retracted medially; the peritoneum between the splenic flexure of the colon and the oesophageal opening in the diaphragm is incised and a flap of peritoneum stripped medially towards the right with the spleen and its vessels and the tail of the pancreas until the gland is exposed on the medial side of the upper pole of the kidney. On each side the suprarenal vein is ligated before the numerous small arteries; the right vein is particularly short and the vena cava is easily torn. The glands must be handled as little as possible before venous ligation to prevent surges of hormone release.

VII. CONCLUSION

The suprarenal glands are paired endocrine glands; retroperitoneal, surmounting the upper pole of the kidney. They are essential to life as the medulla secrete catecholamine. They are structurally sandwich-like made of: two layers of cortex and one thin layer of medulla. They

secrete different adrenal hormones and have several anatomical relations. The adrenal glands have a rich blood supply, their nerves are mainly provided from the celiac plexus, and their lymph drainage is ensured by the para-aortic nodes.