Adrenal Medulla

Adrenal Medulla

Embryologically and histologically distinct from the cortex
Part of the sympathetic nervous system.
Medullary cells synthesize, store and
secrete adrenaline, along with noradrenaline and dopamine

Function of the Adrenal Medulla

an extension of the sympathetic nervous system
acts as a peripheral amplifier
activated by same stimuli as the sympathetic nervous system (examples – exercise, cold, stress, hemorrhage, etc.)

Hormones of the Adrenal Medulla

Adrenaline, Epinephrine
Noradrenaline, Norepinephrine
80% of released catecholamines are epinephrine
Hormones are secreted and stored in the adrenal medulla and released in response to appropriate stimuli

Synthesis

The second step in catecholamine synthesis is the decarboxylation of DOPA to form dopamine

requires pyridoxal phosphate.

Neurons that secrete norepinephrine synthesize it from dopamine in a hydroxylation reaction catalyzed by dopamine β-hydroxylase (DBH) ***mixed-function oxidase***
Ascorbic acid (vitamin C)
Copper (Cu2) is a bound cofactor

Synthesis

The first and rate-limiting step
hydroxylation of the tyrosine ring by tyrosine hydroxylase, a tetrahydrobiopterin (BH4)-requiring enzyme

INACTIVATION AND DEGRADATION OF CATECHOLAMINE

Monamine Oxidase (MAO) and **Catechol-O-Methyl Transferase** (COMT)

MAO is present on the outer mitochondrial membrane of many cells and oxidizes the carbon containing the amino group to an aldehyde, thereby releasing ammonium ion
COMT is also found in many cells, including the erythrocyte. Act on extra neuronal catechols

Phaeochromocytoma
tumours arise from chromaffin cells
90% are in the adrenal medulla
5% of tumours are bilateral
about 10% malignant

Secretion

noradrenaline,adrenaline
normetadrenaline, metadrenaline
4-hydroxy-3-methoxymandelic acid
(HMMA – also known as vanillylmandelic acid or VMA).

Phaeochromocytoma is a rare cause of hypertension (<0.1% of cases)

episodic attacks of symptoms (headache, pallor, palpitations, sweating, panic attacks)
Phaeochromocytoma sometimes occurs as a familial condition, in association with the MEN IIa and Iib syndromes
Diagnosis
demonstrating excessive production of catecholamines or their metabolites in plasma or urine.

plasma-free metadrenalines or urinary fractioned metadrenalines are the most sensitive tests, having sensitivities of 99% and 97%, respectively

plasma catecholamines (sensitivity 84%),
urinary catecholamines (sensitivity 86%),
urinary total metadrenalines (sensitivity 77%) or urinary HMMA (sensitivity 64%) is much less reliable for detecting phaeochromocytoma

24 Hours urinary excretion precaution

Drugs can increase (e.g. vasodilators) or decrease (e.g. reserpine) the release of catecholamines.

Diet Interference from dietary constituents is possible (e.g. HMMA measurement requires the patient to be on a vanilla-free diet).

Timing of urine collections is important in order to
minimise false-negative results
Patient who have attack
Patient with Persistent