Laboratory evaluation of hypertension

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Dept of Chemical Pathology

SA Block 13

Adrenal gland

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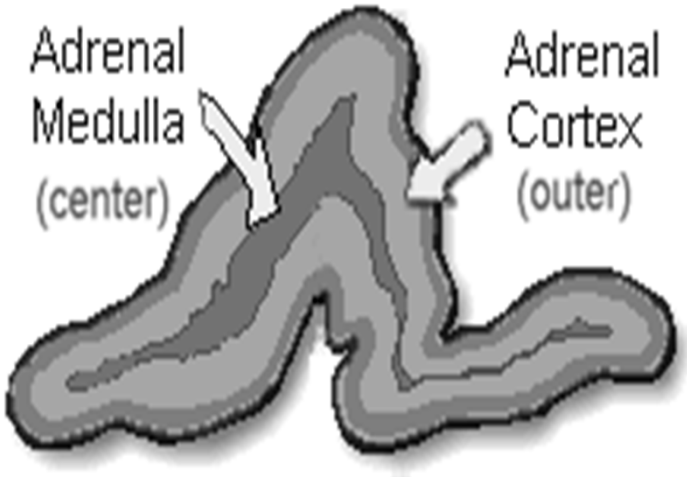
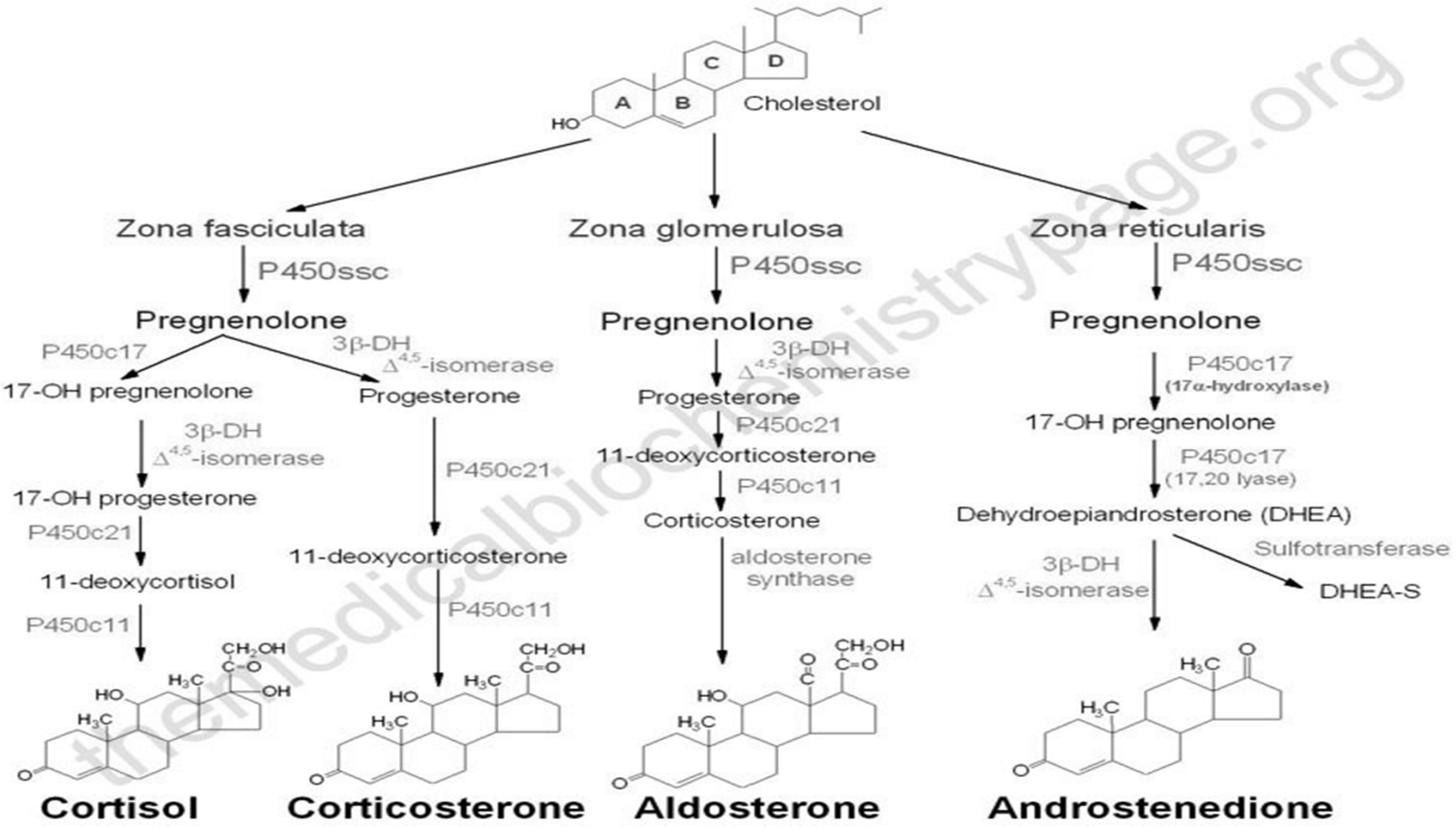


- Zona glomerulosa: mineralocorticoid synthesis
- Zona fascilculata:glucocorticoid synthesis
- Zona fasciculata: androgen synthesis

Adrenal gland steroid biosynthesis



Adrenal disorders

Adrenal Hypofunction:

- Addison’s disease

Adrenal hyperfunction:

- Pheochromocytoma
- Conn’s syndrome
- Cushing syndrome

Addison’s disease

- The cortex involved
- This disease usually not noticeable until the cortex has been completely destroyed

Causes:

- Autoimmune disease
- TB
- Hemorrhagic infarction
- Granulomatous disease
- Trauma
- Amyloidosis
- Neoplasia

Addison’s disease

Clinical manifestations:

- Major weight loss
- Sudden dizziness due to low BP
- Weakness ;dehydration
- Abdominal pain
- Occasional nausea and vomiting

Addison’disease

Routine laboratory tests:

- S-Na <135 mmol/l
- K > 5mmol/l
- Pl.glucose <2.78 mmol/l
- Pl.HCO-3 <15-20 mmol/l
- BUN>7.1 mmol/l

Specific tests: (Pl. cortisol and ACTH confirm adrenal insufficiency)

- Pl ACTH >50 pg/ml (RR < 45 pg/ml)
- Cortisol<138 nmol/l (particularly in stressed or in shock)
- Low ACTH (<5 pg/ml) and cortisol suggest secondary adrenal insufficiency (inappropriate ACTH levels for very low cortisol)

Addison's disease

Diagnostic confirmation:

- Failure of exogenous ACTH or glucagon to increase pl.cortisol
- Secondary adrenal insufficiency is diagnosed by a prolonged ACTH stimulation test, insulin tolerance test,or glucagon test.

ACTH stimulation test: 250 ug IM of cosyntropin (synthetic ACTH)

- Normal pre-injection pl cortisol ranges from 138 to 690 nmol/l and doubles in 30 to 90 min reaching at least 552 nmol/l.
- In addison'disease :Post injection cortisol values are low to normal ,not rising at 30 minutes
- In secondary adrenal insufficiency:

prolonged ACTH stimulation is needed if pituitary failure has caused adrenal atrophy(and hence failure to respond to ACTH),therefore patient needs to be primed with long acting ACTH 1mg once/day for 3 days before cosyntropin test if pituitary disease is suspected

Addison's disease

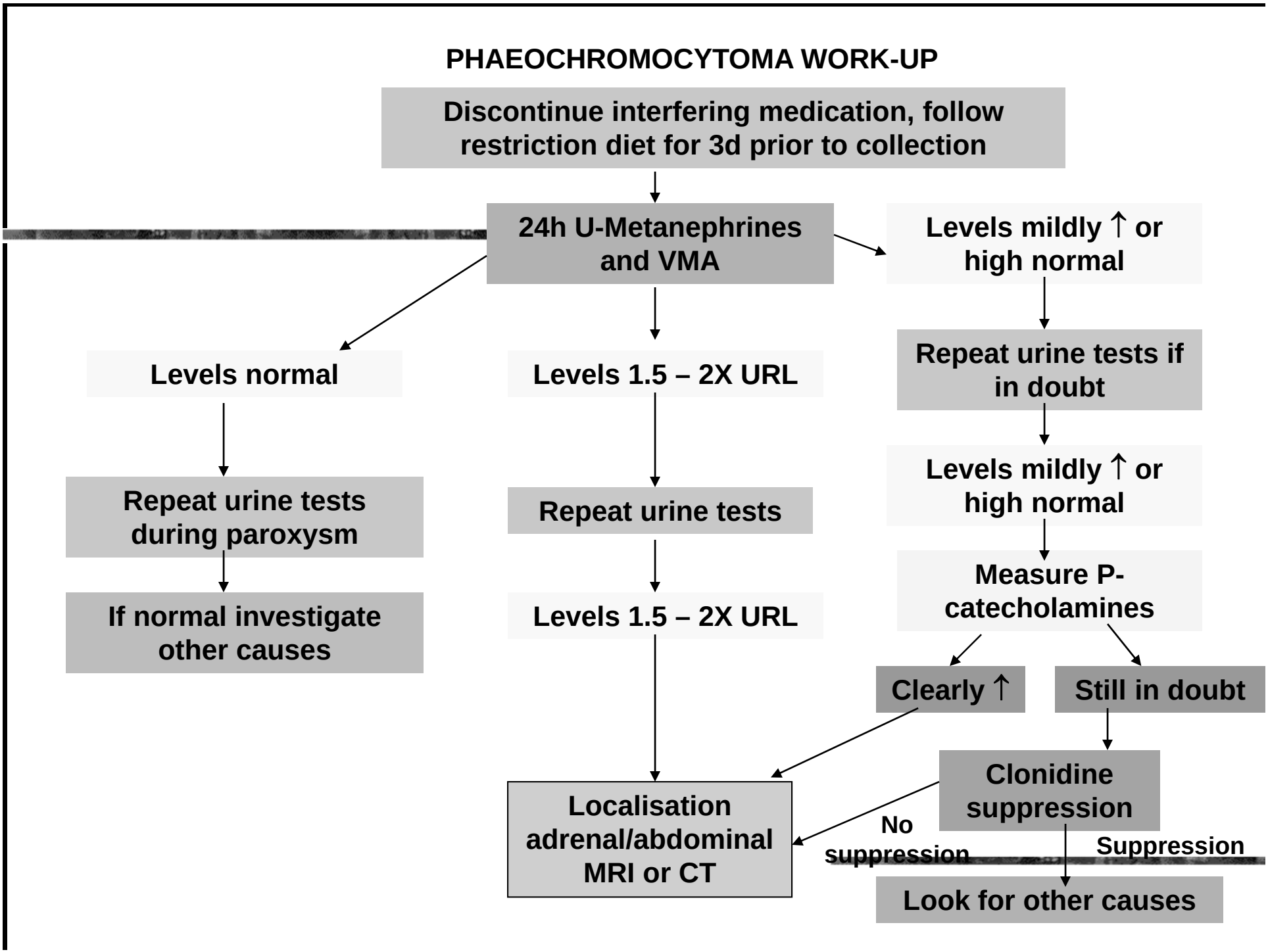
Cosyntropin 1mg IM is given and cortisol measured at intervals for 24 hr.

Results :

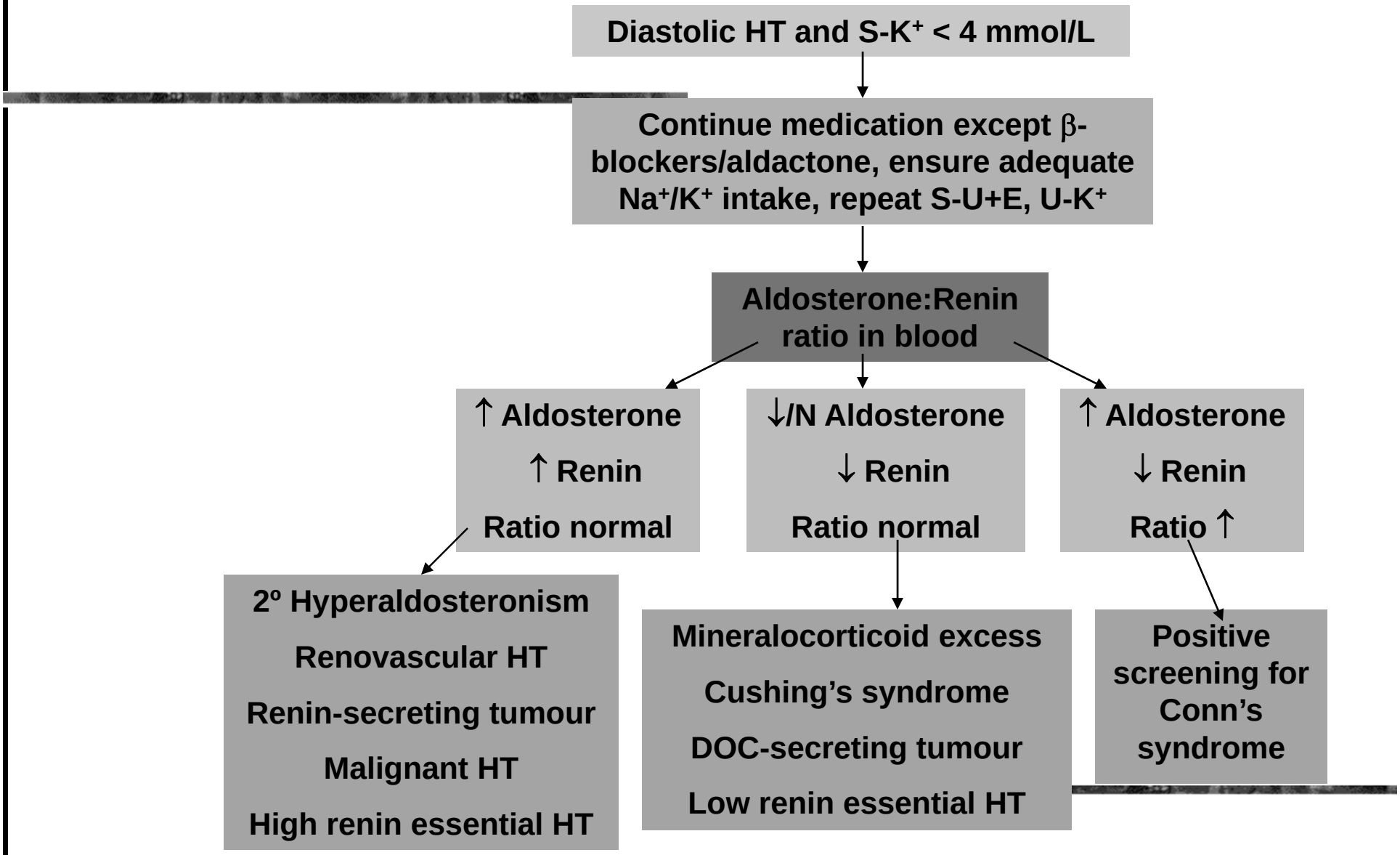
- For the 1st hour results similar for both the short and prolonged tests
- In addison's disease,no further rise beyond 60 min.
- In secondary and tertiary adrenal insufficiency ,cortisol levels continue to rise for >24 hr.

Only in cases of prolonged adrenal atrophy is adrenal priming (with long acting ACTH)necessary

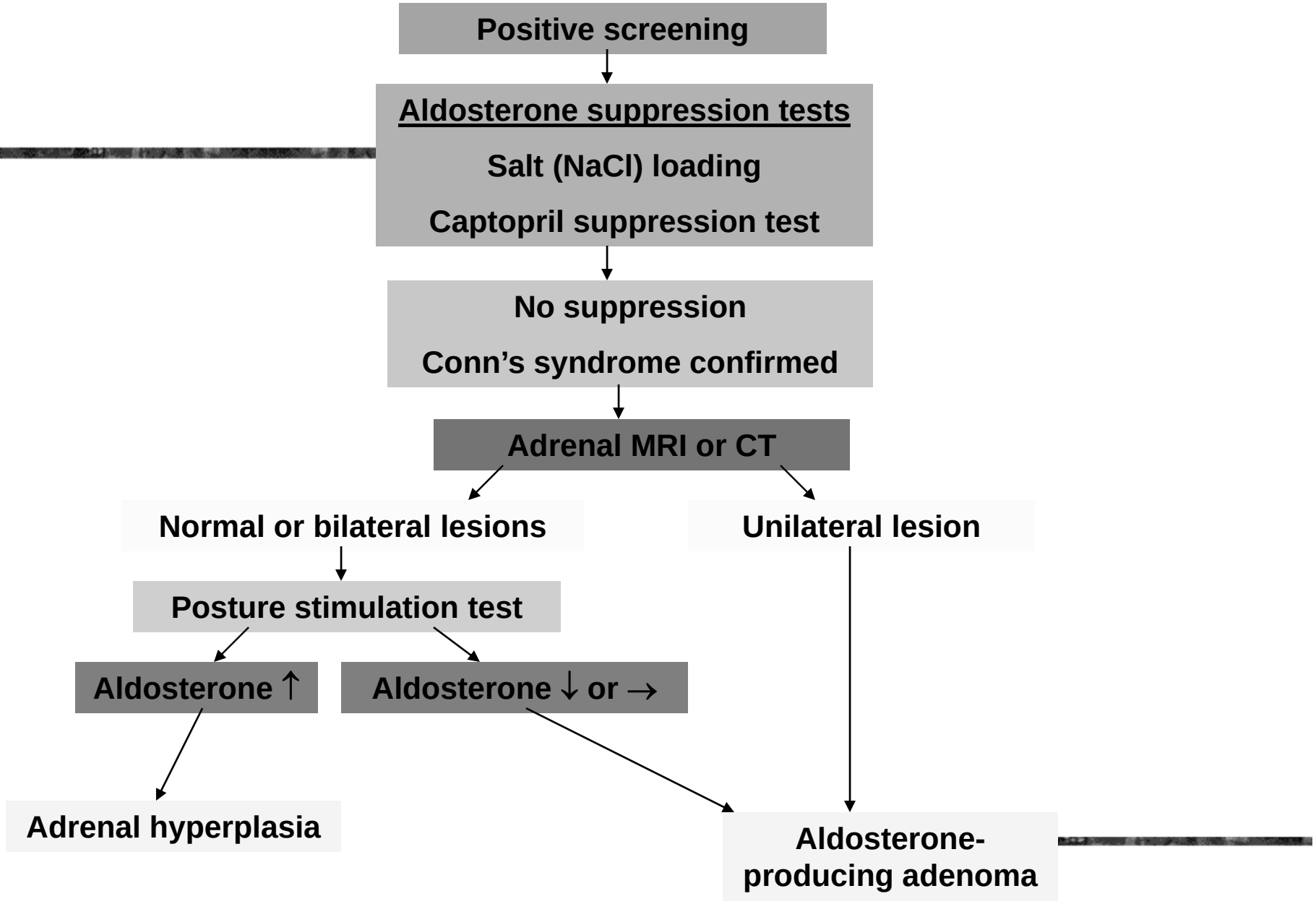
The simple short test is usually done initially ,because a normal response obviates the need for further investigation.

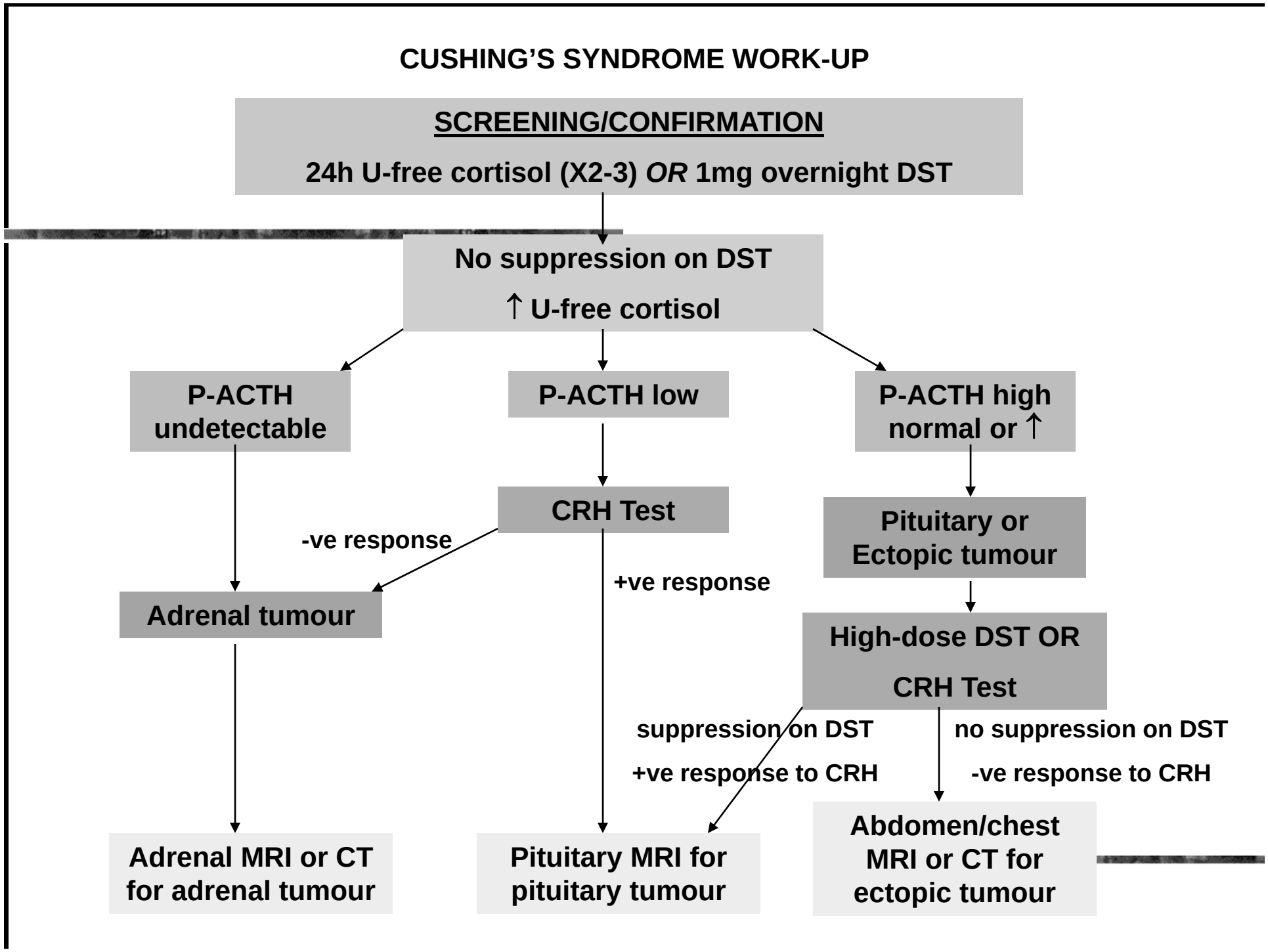

PHAEOCHROMOCYTOMA WORK-UP
Discontinue interfering medication, follow restriction diet for 3d prior to collection
24h U-Metanephrines and VMA
Levels mildly ↑ or high normal
Repeat urine tests if in doubt
Levels mildly ↑ or high normal
Measure P-catecholamines
Clearly ↑
Still in doubt
Clonidine suppression
No suppression
Suppression
Look for other causes
Levels normal
Repeat urine tests during paroxysm
If normal investigate other causes
Levels 1.5 – 2X URL
Repeat urine tests
Levels 1.5 – 2X URL
Localisation adrenal/abdominal MRI or CT

CONN'S SYNDROME SCREENING TESTS



CONN'S SYNDROME CONFIRMATION/LOCALISATION




CUSHING'S SYNDROME WORK-UP
SCREENING/CONFIRMATION
24h U-free cortisol (X2-3) OR 1mg overnight DST
No suppression on DST
↑ U-free cortisol
P-ACTH undetectable
P-ACTH low
P-ACTH high normal or ↑
CRH Test
-ve response
+ve response
Pituitary or Ectopic tumour
Adrenal tumour
High-dose DST OR CRH Test
suppression on DST
+ve response to CRH
no suppression on DST
-ve response to CRH
Adrenal MRI or CT for adrenal tumour
Pituitary MRI for pituitary tumour
Abdomen/chest MRI or CT for ectopic tumour