Pituitary disorders
lecture 2

Haider Ayad Alidrisi MD FIBMS CABM MSc Endocrinology
University of Basrah, College of Medicine

Previous lecture

- Pituitary anatomy & physiology.
- Classification of pituitary disorders, and adenoma.
- Prolactinoma
- Acromegaly

Objectives

- Clinical presentations, and management of NFPA.
- Management of pituitary incidentaloma.

- Diabetes insipidus (DI)
  - Presentation
  - Etiology
  - Investigations: interpretation of the water deprivation test
  - Management of cranial DI

Non-secretory pituitary adenomas (Clinically non-functioning pituitary adenoma(NFPA)

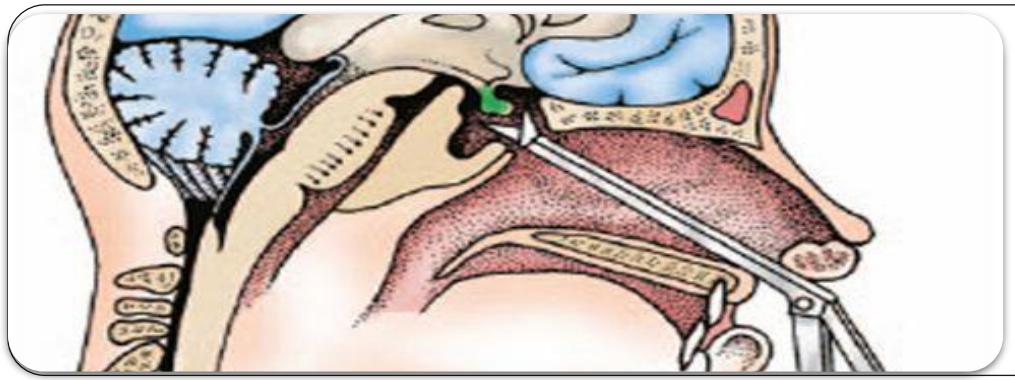
Non-secretory pituitary adenomas (Clinically non-functioning pituitary adenoma(NFPA)

- Asymptomatic, as pituitary incidentaloma
- Usually large at the time of diagnosis.
- If symptomatic, due to pressure effect

Clinical features (by pressure)

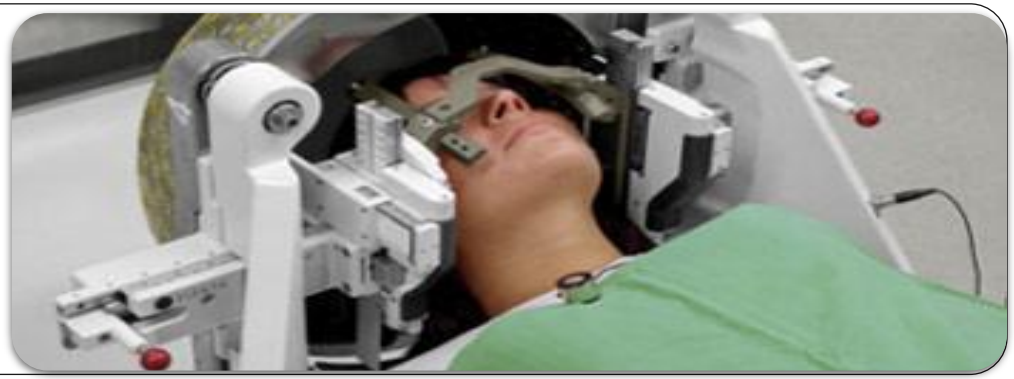
- Bitemporal hemianopsia as a result of compression of the optic chiasm
- Hypopituitarism from compression of the pituitary gland, hypogonadism in men and in premenopausal women
- Cranial nerve deficits caused by extension into the cavernous sinus
- Hydrocephalus from extension into the third ventricle, compressing the foramen of Monro.
- Diabetes insipidus resulting from compression of the hypothalamus or pituitary stalk (a rare complication).

Treatment for symptomatic



Transsphenoidal resection of the adenoma is the treatment od choice

The risk of recurrence is greater with these tumors and adjunctive therapy such as irradiation may also be necessary.



Stereotactic radiosurgery

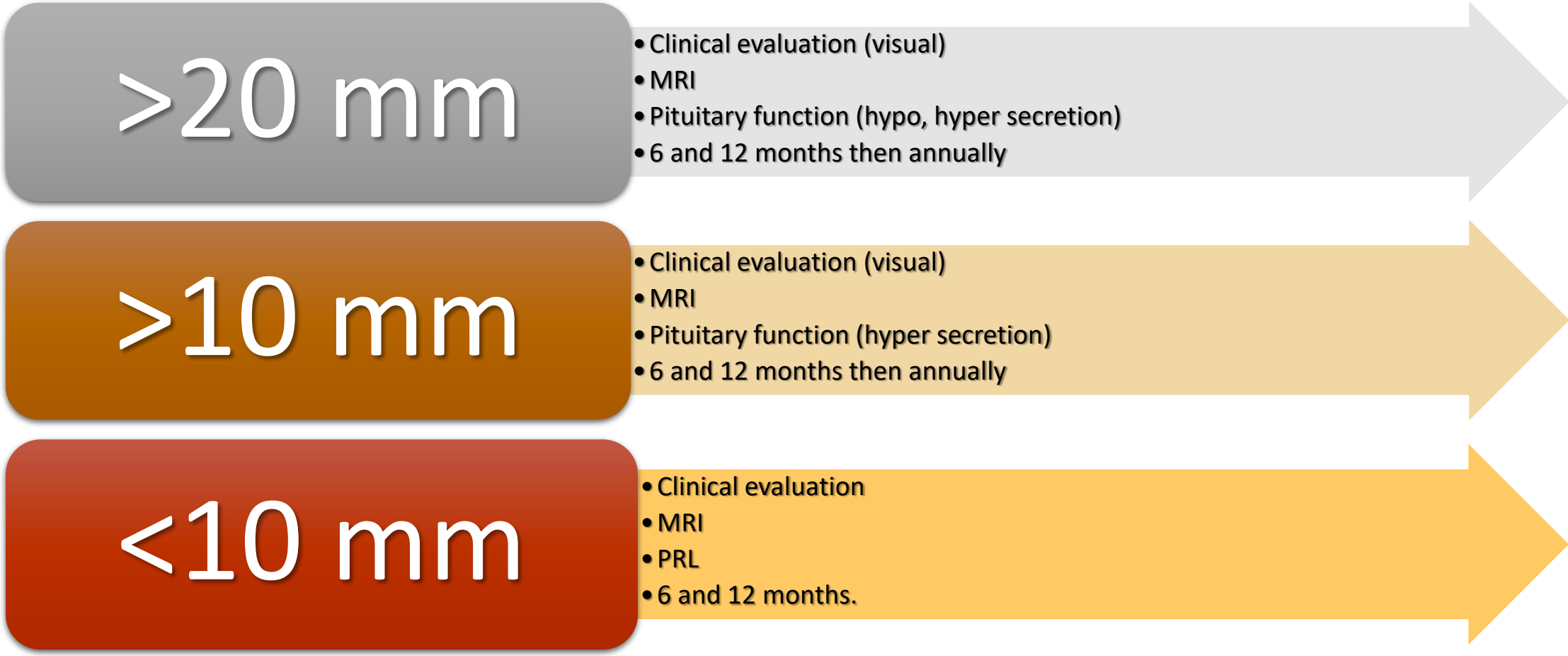
is reserved for patients who have not responded to surgical treatment and who still have symptoms of the adenoma.

Case scenario

- A 30-year old woman is referred to you after an incidental MRI finding of a 9 mm pituitary adenoma that was done for evaluation of headache. Everything is normal on clinical examination.
- What is next in evaluation:

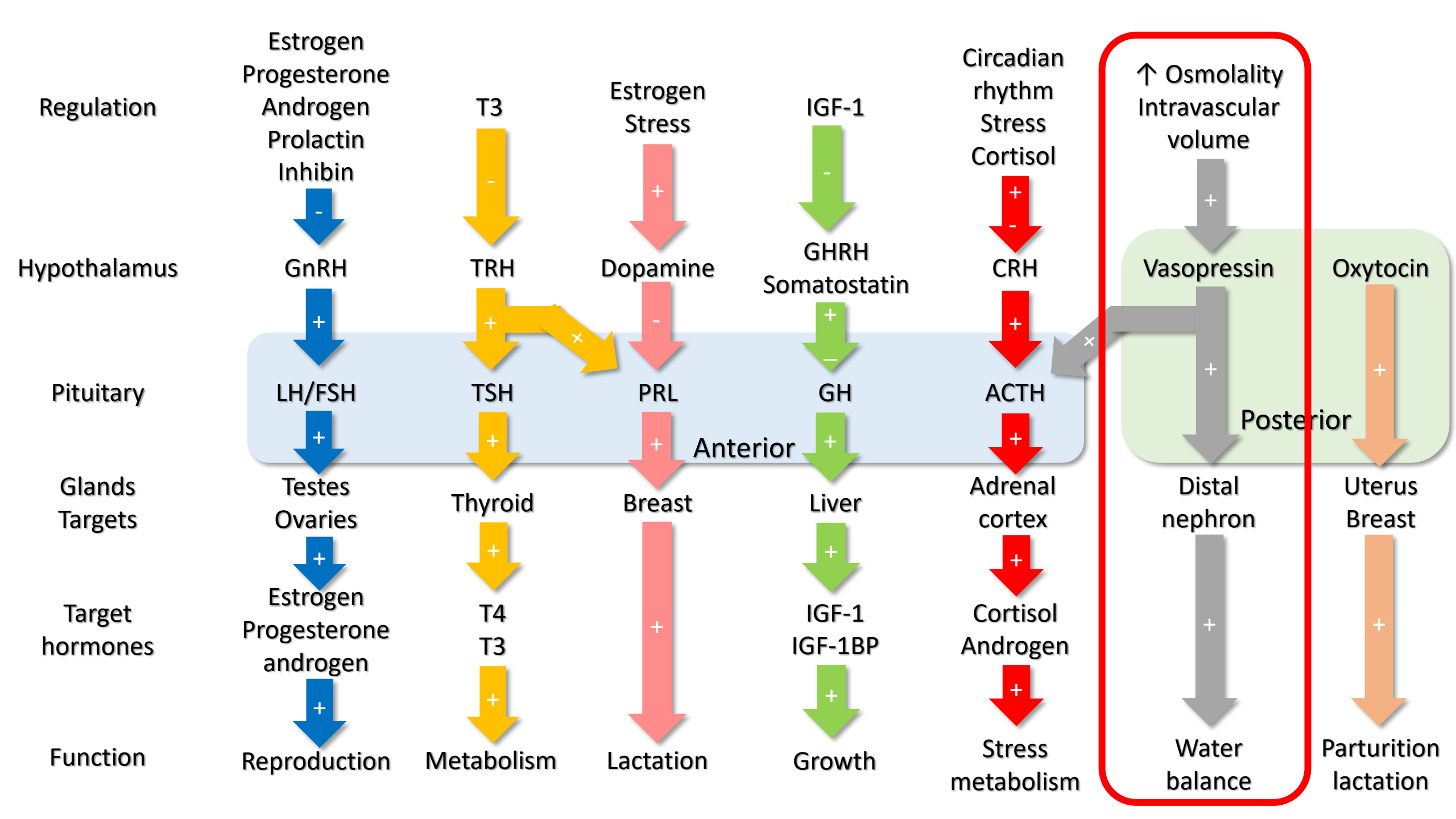
1. GH after OGTT
2. PRL
3. Visual field testing
4. Cortisol
5. TSH

Asymptomatic (incidentaloma)

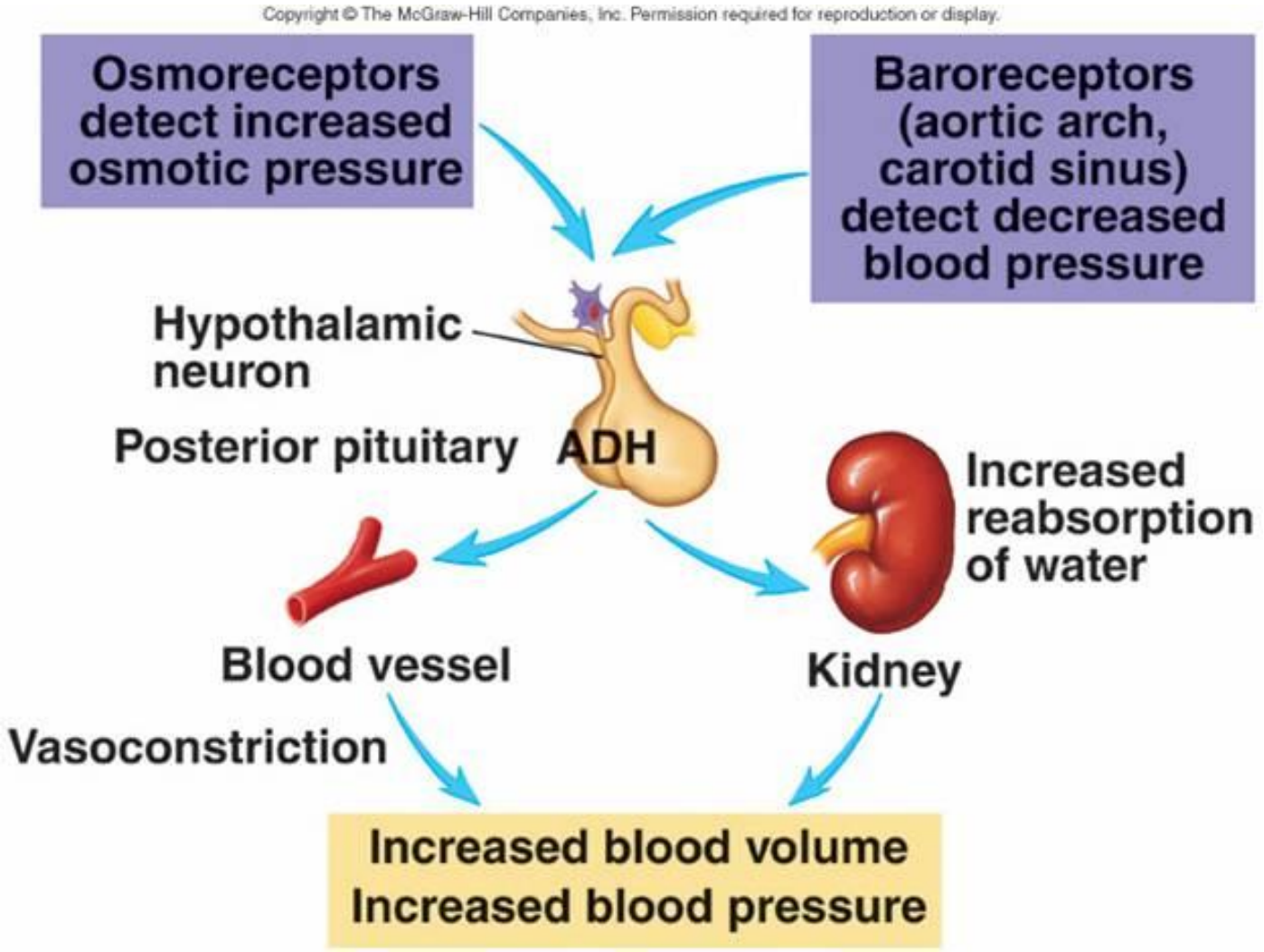


Diabetes insipidus

Haider Ayad Alidrisi MD FIBMS CABM MSc Endocrinology
University of Basrah, College of Medicine, Department of Medicine


Regulation
Hypothalamus
Pituitary
Glands
Targets
Target
hormones
Function
Estrogen
Progesterone
Androgen
Prolactin
Inhibin
GnRH
LH/FSH
Testes
Ovaries
Estrogen
Progesterone
androgen
Reproduction
T3
TRH
TSH
Thyroid
T4
T3
Metabolism
Estrogen
Stress
Dopamine
PRL
Breast
Lactation
IGF-1
GHRH
Somatostatin
GH
Liver
IGF-1
IGF-1BP
Growth
Circadian
rhythm
Stress
Cortisol
CRH
ACTH
Adrenal
cortex
Cortisol
Androgen
Stress
metabolism
↑ Osmolality
Intravascular
volume
Vasopressin
Distal
nephron
Water
balance
Oxytocin
Uterus
Breast
Parturition
lactation
Anterior
Posterior

Diabetes Insipidus: physiology



Antidiuretic hormone binds to receptors on cells in the collecting ducts of the kidney and promotes reabsorption of water back into the circulation.

Definition

- Diabetes insipidus is a polyuric disorder resulting from insufficient production of antidiuretic hormone (ADH) (pituitary [neurogenic] diabetes insipidus) or unresponsiveness of the renal tubules to ADH (nephrogenic diabetes insipidus).

Plasma Osmolality versus osmolarity

Normal 285 - 295 milliosmoles per kilogram (mOSm/kg) of water

Measured Osmolality: can be measured on an analytical instrument.

Calculated Osmolality: Calculated osmolarity = 2 Na + **2 K** + Glucose + Urea (all in mmol/L)

Urine osmolality

In healthy individuals with restricted fluid intake, urine osmolality should be greater than 800mOsm/kg

24 hour urine: 500-800 mOsm/kg, random

Random urine osmolality should be 50 to 1400 mOsm/kg

Calculated Urine **osmolality** = 2(Na + K) + Urea (mmol)in urine + Glucose (mmol) in urine

Measured Urine **osmolality is by osmometer directly.**

Clinical features

Polyuria: urinary volumes ranging from 2.5 to 6 L/day

Polydipsia (predilection for cold or iced drinks), depends on intact thirst center

Neurologic manifestations (seizures, headaches, visual field defects) due to hypernatremia.

Evidence of volume contractions,

The physical findings and clinical manifestations are generally not evident until vasopressin secretory capacity is reduced to <20%of normal

Etiology

Neurogenic diabetes insipidus

- Idiopathic
- Neoplasms of brain or pituitary fossa (craniopharyngiomas, metastatic neoplasms from breast or lung)
- Posttherapeutic neurosurgical procedures(e.g., hypophysectomy)
- Head trauma (e.g., basal skull fracture)
- Neurosarcoidosis, histiocytosis X

Nephrogenic diabetes insipidus

- Drugs: lithium, amphotericin B,
- Familial: X-linked (DIDMOD)
- Metabolic: hypercalcemia or hypokalemia
- Other: sarcoidosis, amyloidosis, pyelonephritis, polycystic disease, sickle cell disease, postobstructive,

Differential diagnosis

- Diabetes mellitus, nephropathies
- Primary polydipsia, medications (e.g., chlorpromazine)
- Osmotic diuresis (glucose, mannitol)
- Psychogenic polydipsia, electrolyte disturbances

Investigations

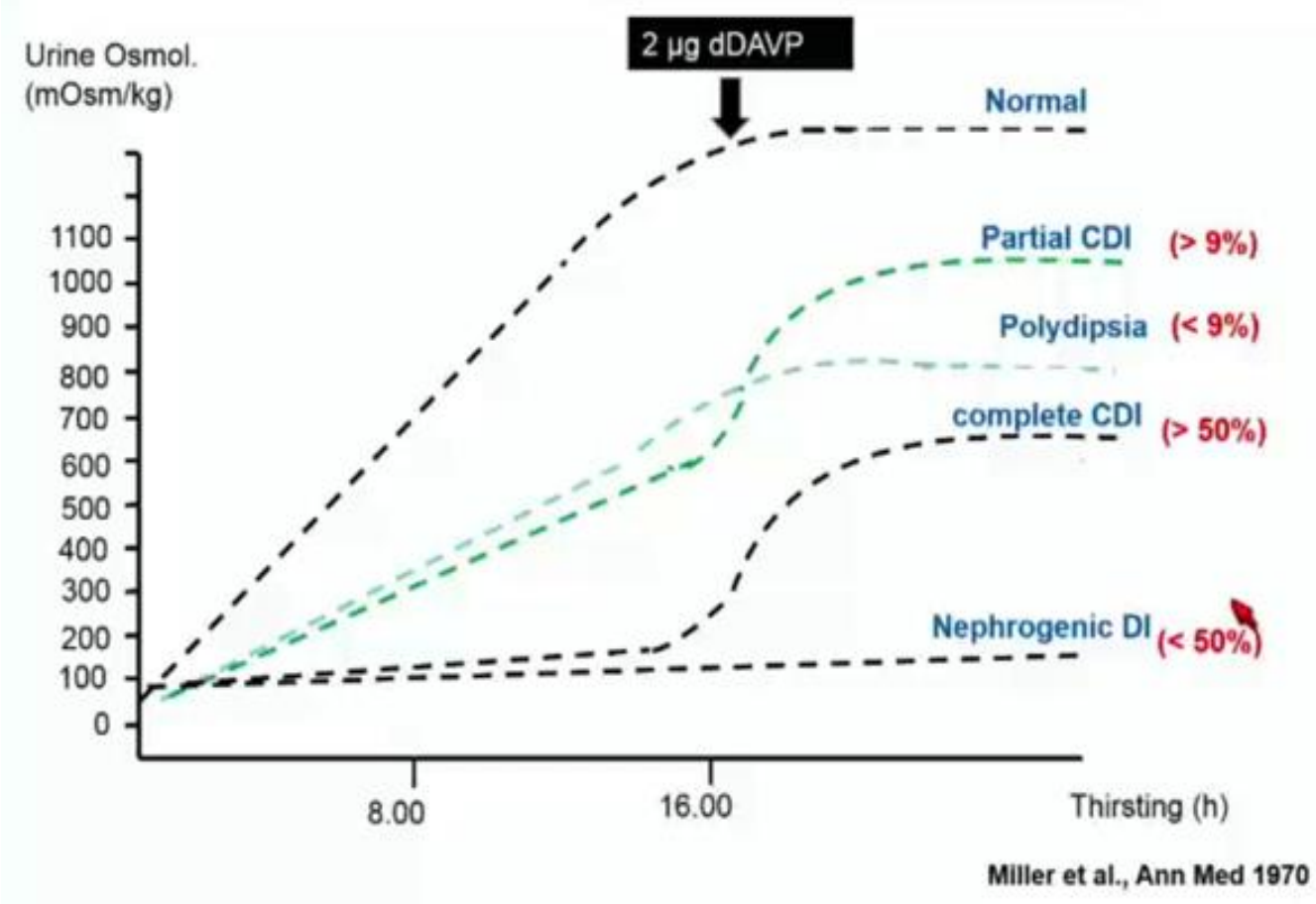
- The diagnostic workup is aimed at showing that polyuria is caused by the inability to concentrate urine and determining whether the problem is the result of decreased ADH or insensitivity to ADH. This is done with the

Water deprivation test

- After baseline measurement of weight, plasma sodium, and urine and plasma osmolarity, the patient is deprived of fluids under strict medical supervision.

Interpretation of the water deprivation test

- Serum osmolality ≥ 300 mosm/kg H2O and Urine osmolality<600 mosm/kg H2O:indicate ***Diabetes insipidus***.
- To distinguish nephrogenic from neurogenic diabetes insipidus, the patient is given 2 µg IM or SC of vasopressin (ADH) and the change in urine **osmolality** is measured. A significant increase (>50%) in urine **osmolality** after administration of ADH is indicative of neurogenic diabetes insipidus.



Laboratory tests

- Decreased urinary specific gravity (1.005)
- Decreased urinary osmolality(usually <200 mOsm/kg) even in the presence of high serum osmolality
- Hypernatremia, increased plasma osmolality,

Case scenario

- A 40-year-old woman presented with headache, polyuria and polydipsia for six months. She has a treated breast cancer 3 years ago. Labs shows RBS = 90 mg/dl, Na = 147. A supervised water deprivation was done,

Time	P. osmolality	U. Osmolality
Start	299	150
1 hour	304	230
I.V 2 µg vasopressin		400

The girl has:

A. Neurogenic diabetes insipidus.

B. Nephrogenic diabetes insipidus.

C. Primary polydipsia

E. Syndrome of inappropriate ADH secretion.

Case scenario (continue)

- What is the next step in the investigation of this woman?

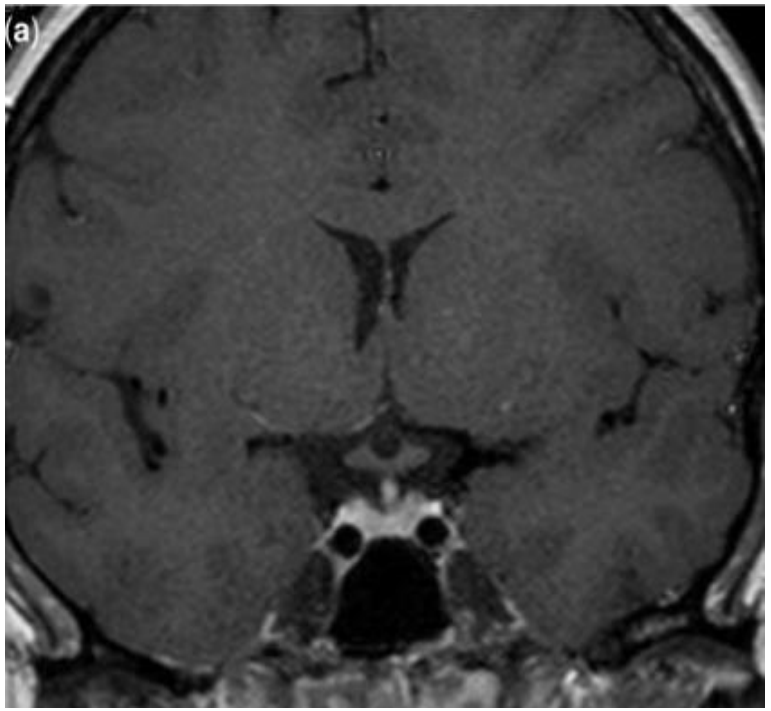
A. CT brain

B. CT pituitary

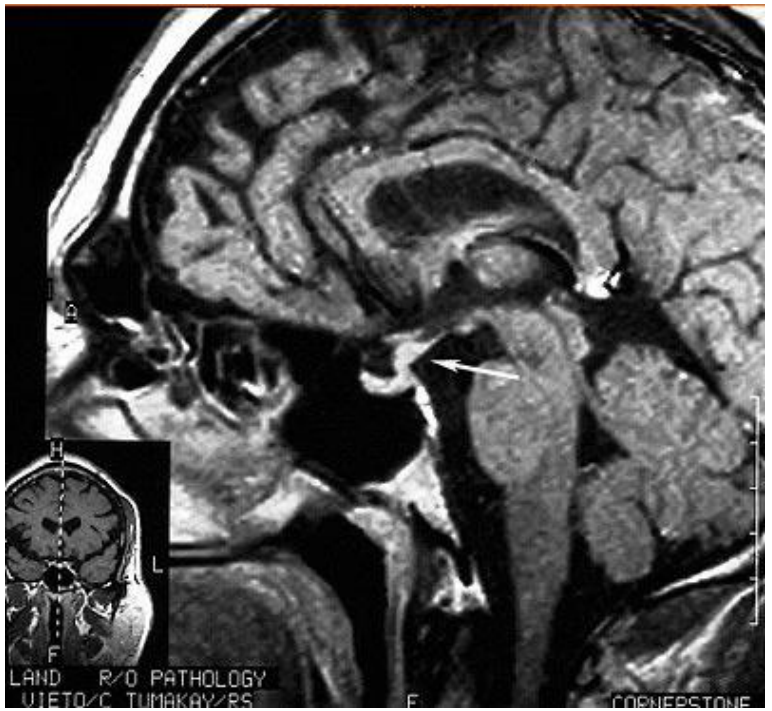
C. MRI brain

E. MRI pituitary

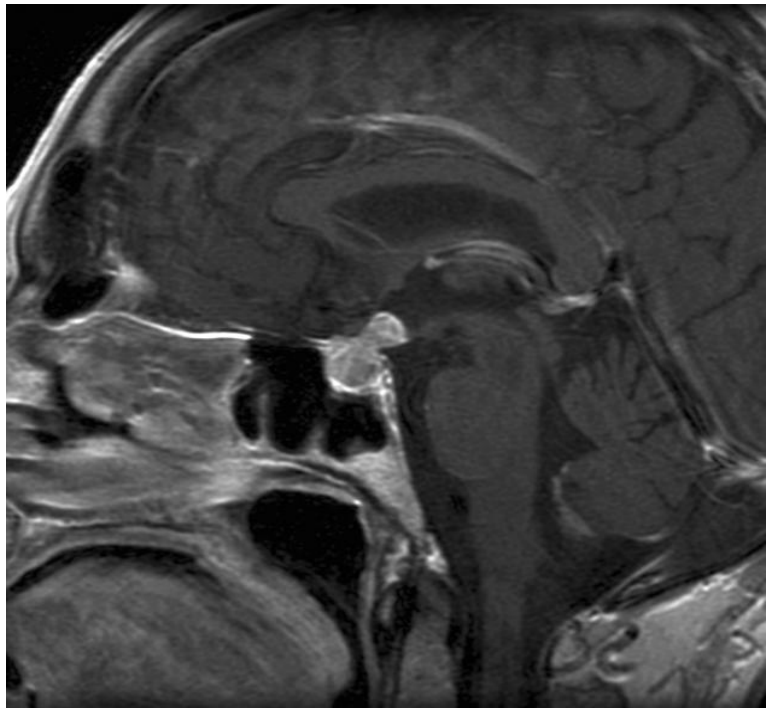
Imaging studies



Sarcoidosis



Histiocytosis X



Breast cancer

Treatment (neurogenic DI)

Desmopressin acetate (DDAVP) 10 to 40 mcg qd intranasally in one to three divided doses .

In mild cases of neurogenic diabetes insipidus, polyuria may be controlled with hydrochlorothiazide 50 mg qd (decreases urine volume by increasing proximal tubular reabsorption of glomerular infiltrate).

Treatment (Nephrogenic DI)

Removal of the underlying cause.

- However, prolonged lithium therapy can lead to irreversible nephrogenic diabetes insipidus even after lithium therapy is withdrawn.

Adequate hydration.

Low-sodium diet and hydrochlorothiazide to induce mild sodium depletion.

Indomethacin may also be useful to reduce urine volume.

Case scenario

- A 20-year-old girl presented with headache, polyuria and polydipsia for six months. Labs shows RBS = 90 mg/dl, Na = 135, plasma osmolarity = 285, urine osmolarity = 200. After supervised water deprivation, plasma osmolarity 293, and urine osmolarity = 500 and increased to 520 after 2 μg vasopressin. The girl has:

A. Neurogenic diabetes insipidus.

B. Nephrogenic diabetes insipidus.

C. Primary polydipsia

D. Diabetes mellitus

E. Syndrome of inappropriate ADH secretion.