# Parathyroids

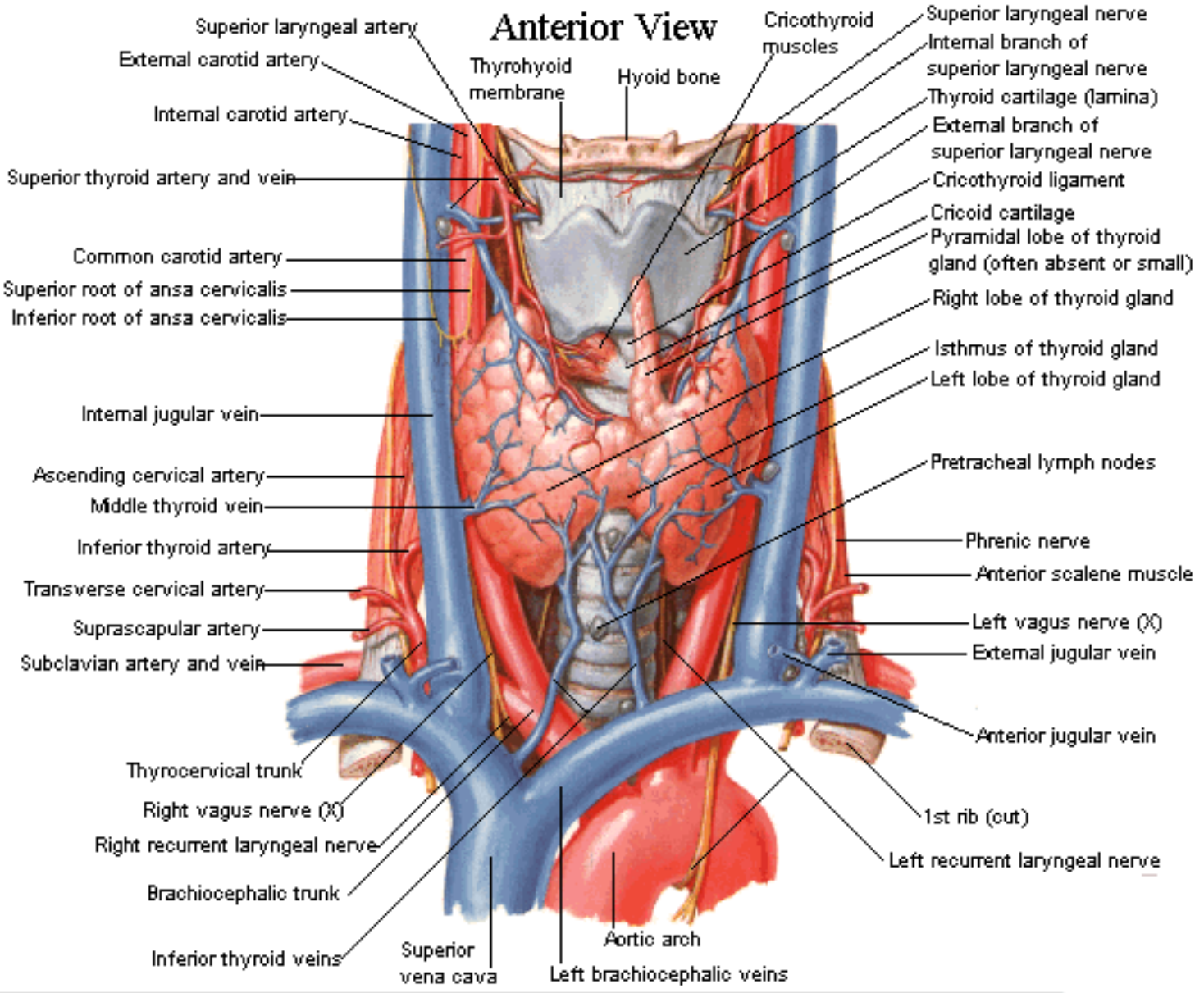
SURGICAL REGISTRAR TEACHING
LIVERPOOL HOSPITAL
NOVEMBER 10TH, 2014

# Anatomy of parathyroid

- Normally lies behind the lateral lobe of the thyroid gland (either within or outside the thyroid's capsule)
- Usually 4 glands (90% of patients)
- Total weight of no more than 200mg

# Thyroid Gland

## Anterior View



# Anatomy continued

- Superior gland: more constant in position. Back of the thyroid lobe at the level of the 1st tracheal ring and above the inferior thyroid artery.
- Inferior gland: more variable in position. Usually behind lower pole. Below the inferior thyroid artery and lateral to the recurrent laryngeal nerve
- If difficulty finding them: follow the inferior thyroid artery upwards and downwards – a small branch enters each gland.

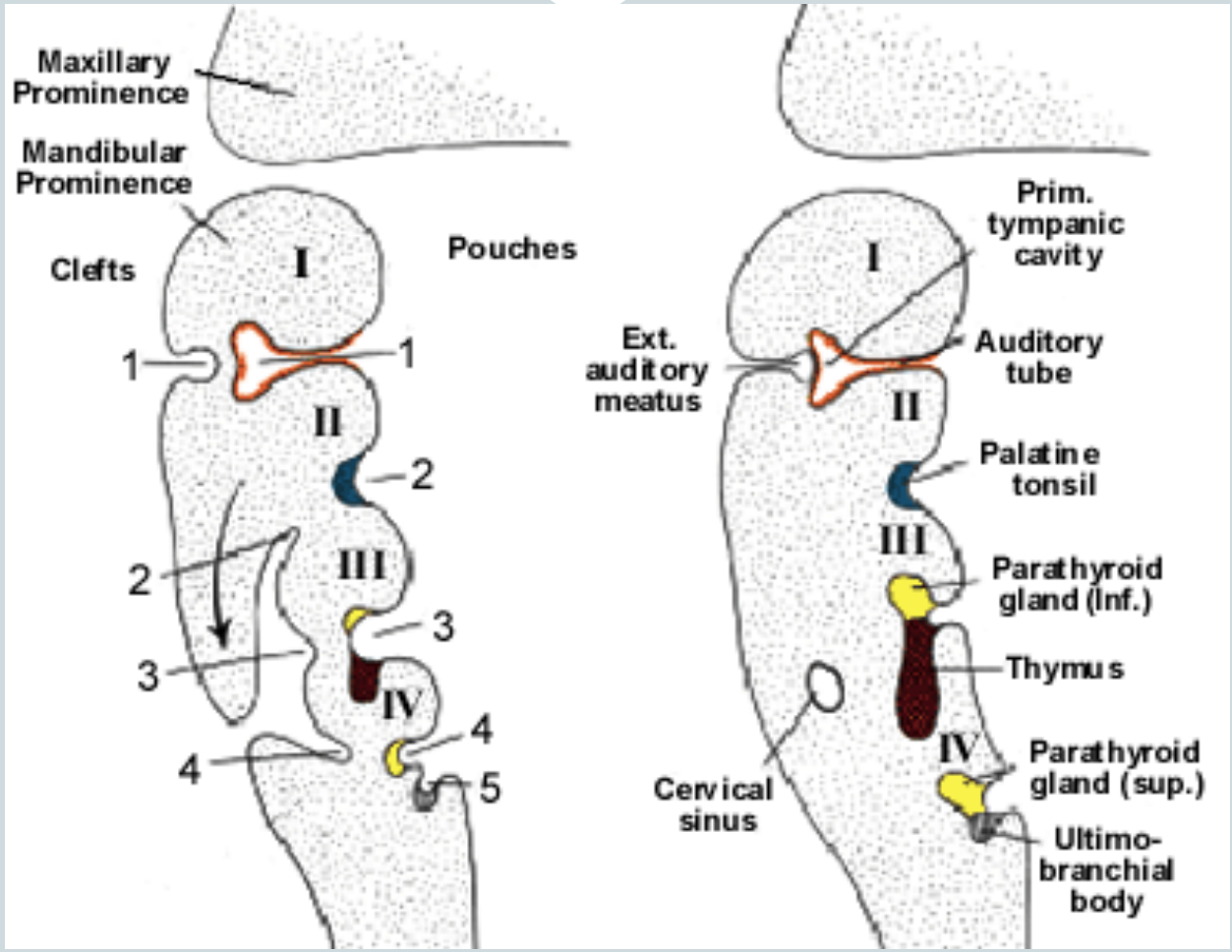
# Blood supply

- Both upper and lower usually supplied by inferior thyroid artery.

# Structure

- Histological section the gland is homogenous and very vascular.
- It's a mass of closely packed principal cells which secrete PTH.
- Oxyphil cells – unknown function

# Embryology


Maxillary Prominence
Mandibular Prominence
Clefts
Pouches
I
II
III
IV
1
2
3
4
5
Prim. tympanic cavity
Ext. auditory meatus
Auditory tube
Palatine tonsil
Parathyroid gland (Inf.)
Thymus
Parathyroid gland (sup.)
Cervical sinus
Ultimo-branchial body

# Development

- Superior gland is called parathyroid IV because it develops from the dorsal diverticulum of the fourth pharyngeal pouch
- Inferior gland is parathyroid III – developed from the third pouch but displaced caudally by the descent of the thymus from the same pouch.
- The inferior gland which develops higher up has longer to travel and can end up in unusual positions.

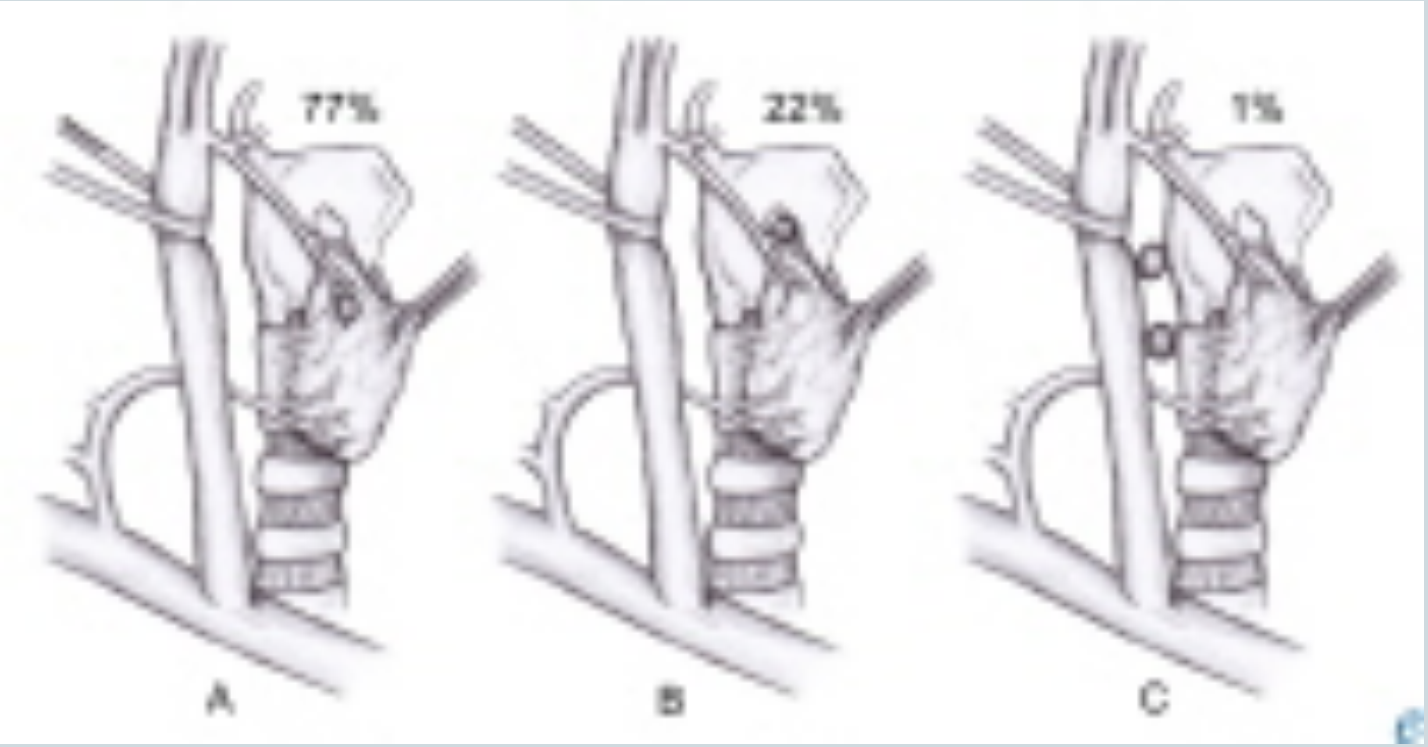
# Clinical correlations of embryology

- Accessory or supernumerary parathyroid glands are found in approximately 13% of individuals at autopsy.
  - These glands most likely result from tissue fragmentation occurring during the migration of the glands
- Absence of parathyroids (ie, < 4 glands) is noted in approximately 3% of individuals at autopsy. This absence may result from a failure of the primordia to differentiate into the parathyroid glands

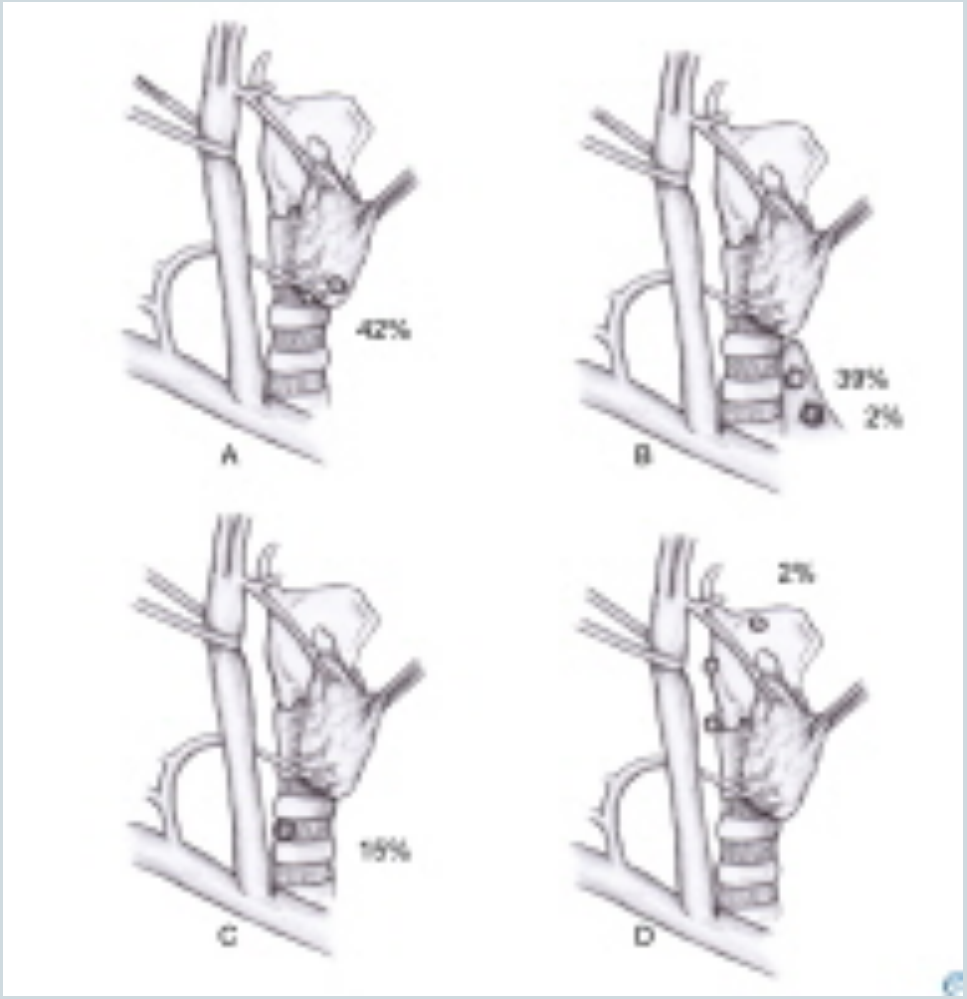
# Clinical correlations of embryology

- Ectopic parathyroid glands occur in 15-20% of patients. The glands may be located anywhere near or even within the thyroid or thymus.
- If parathyroid IVs do not descend entirely, they may be located as high as the bifurcation of the common carotid artery.
- Conversely, if parathyroid IIIs do not release from the thymus, they may be located intrathoracically, as low as the aortopulmonary window. Other common ectopic locations include the anterior mediastinum, posterior mediastinum, and retroesophageal and prevertebral regions.
- However, even when the parathyroid glands are in an ectopic location, they still often are symmetrical from side to side, making localization somewhat easier.

# Superior Parathyroids



# Inferior parathyroids



# Surgical approach

- Lobes of the thyroid are exposed as for thyroidectomy, and then retracted forwards and medially so that the posterior surface can be inspected for the parathyroids.
- Backdoor approach?

# Physiology

- Role in calcium homeostasis
  - Parathyroid hormone (PTH) – secreted by parathyroid gland
  - 1,25-Dihydroxycholecalciferol (calcitriol) from vitamin D
  - Calcitonin – secreted by thyroid gland
- PTH:
  - Mobilizes calcium from bone and increases urinary phosphate excretion (half life is 10 minutes)
- 1-25-Dihydroxycholecalciferol:
  - Increases calcium absorption from the intestine
- Calcitonin:
  - Lowers calcium by inhibiting bone resorption (minor role)

# PTH

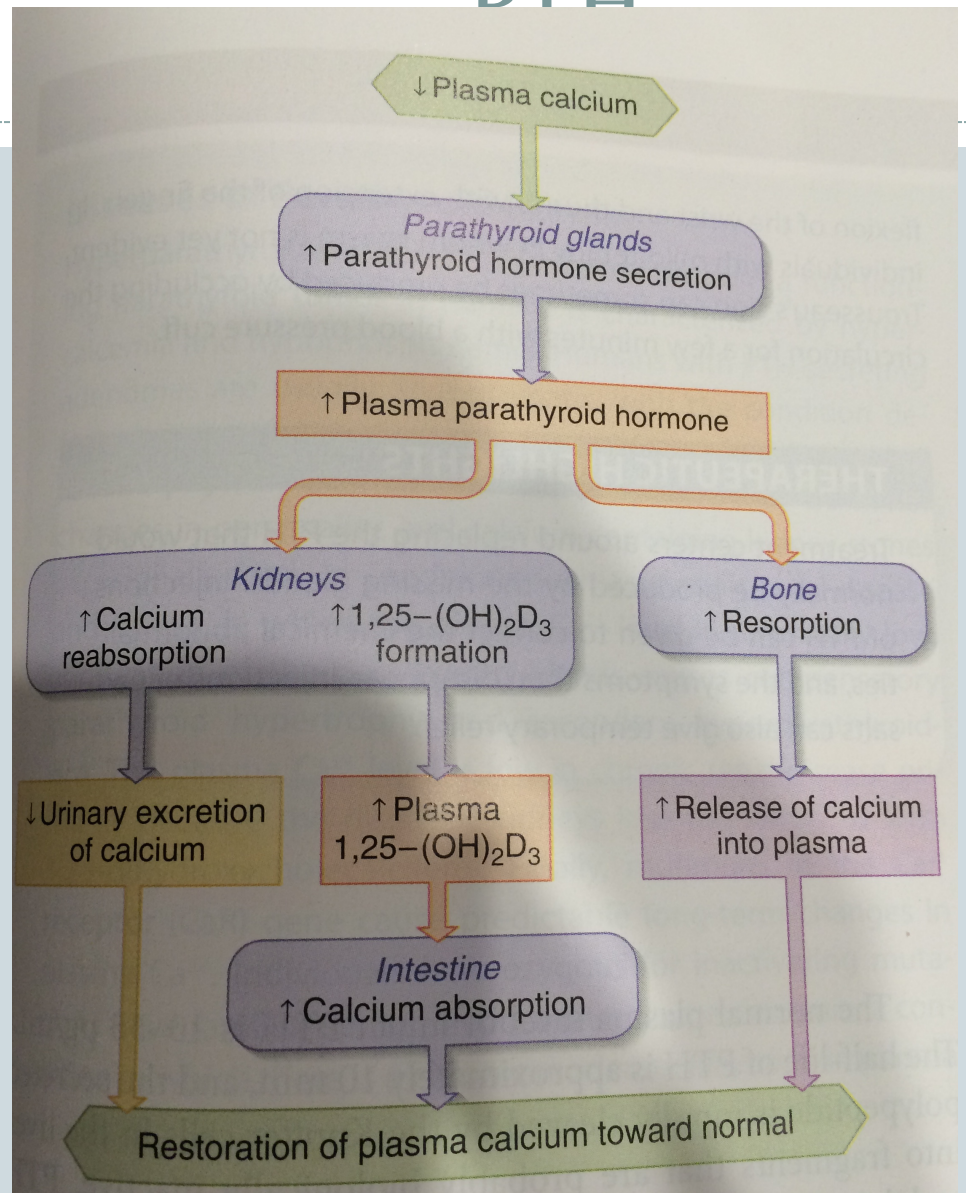
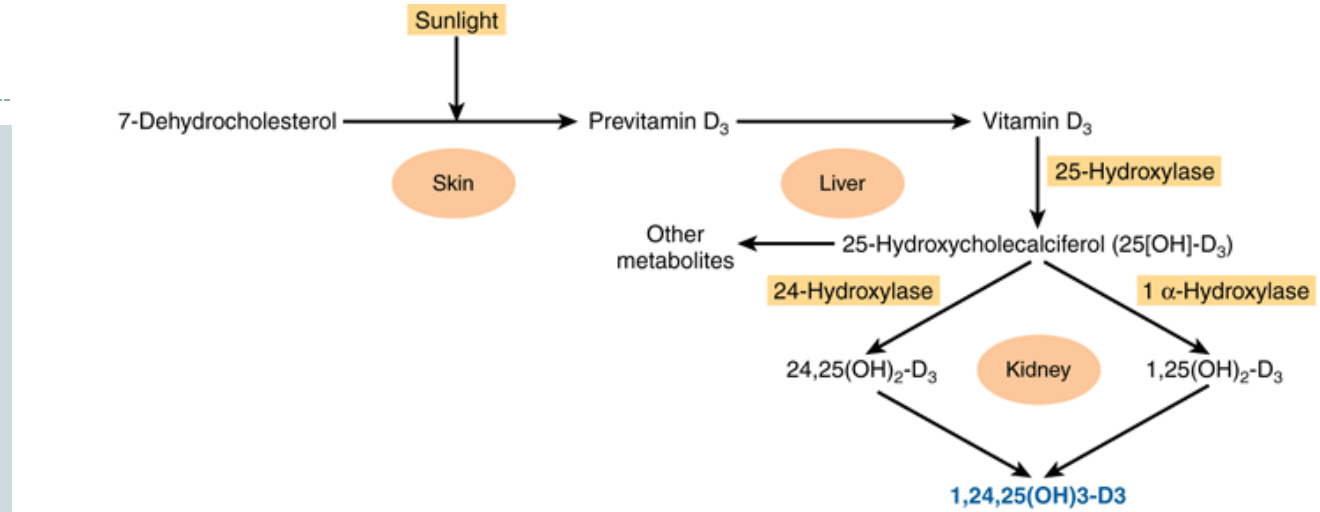
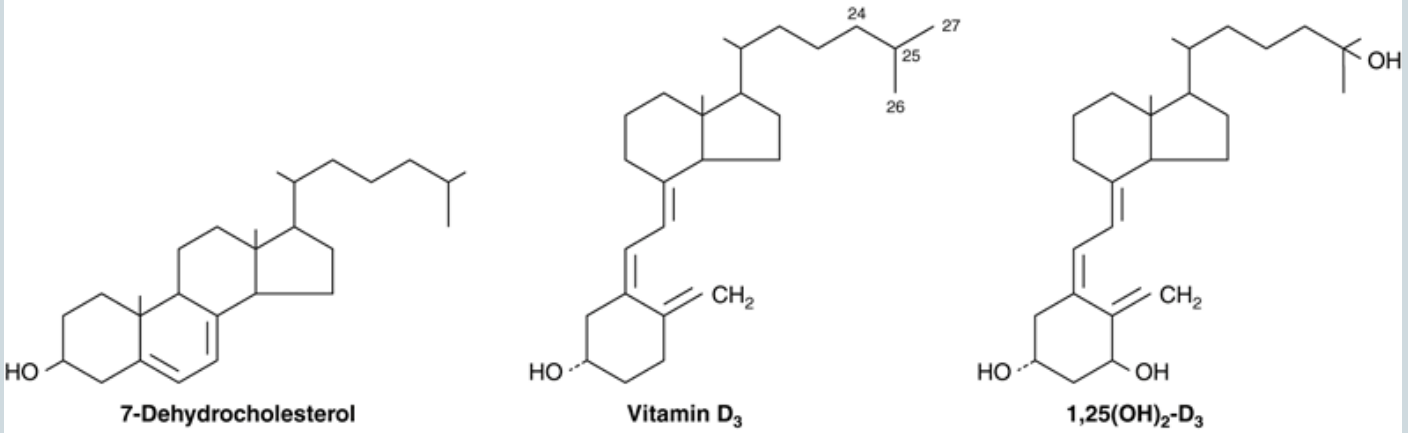



**FIGURE 21–3** Effects of PTH and




Source: Murray RK, Bender DA, Botham KM, Kennelly PJ, Rodwell VW, Weil PA: *Harper's Illustrated Biochemistry, 29th Edition*: www.accessmedicine.com

# Calcitriol

- 1,25 Dihydroxycholecalciferol (calcitriol) stimulates expression of gene products involved in calcium transport in the intestine.
  - Also increases calcium reabsoption in the kidneys via increased TRPV5 expression in the proximal tubules