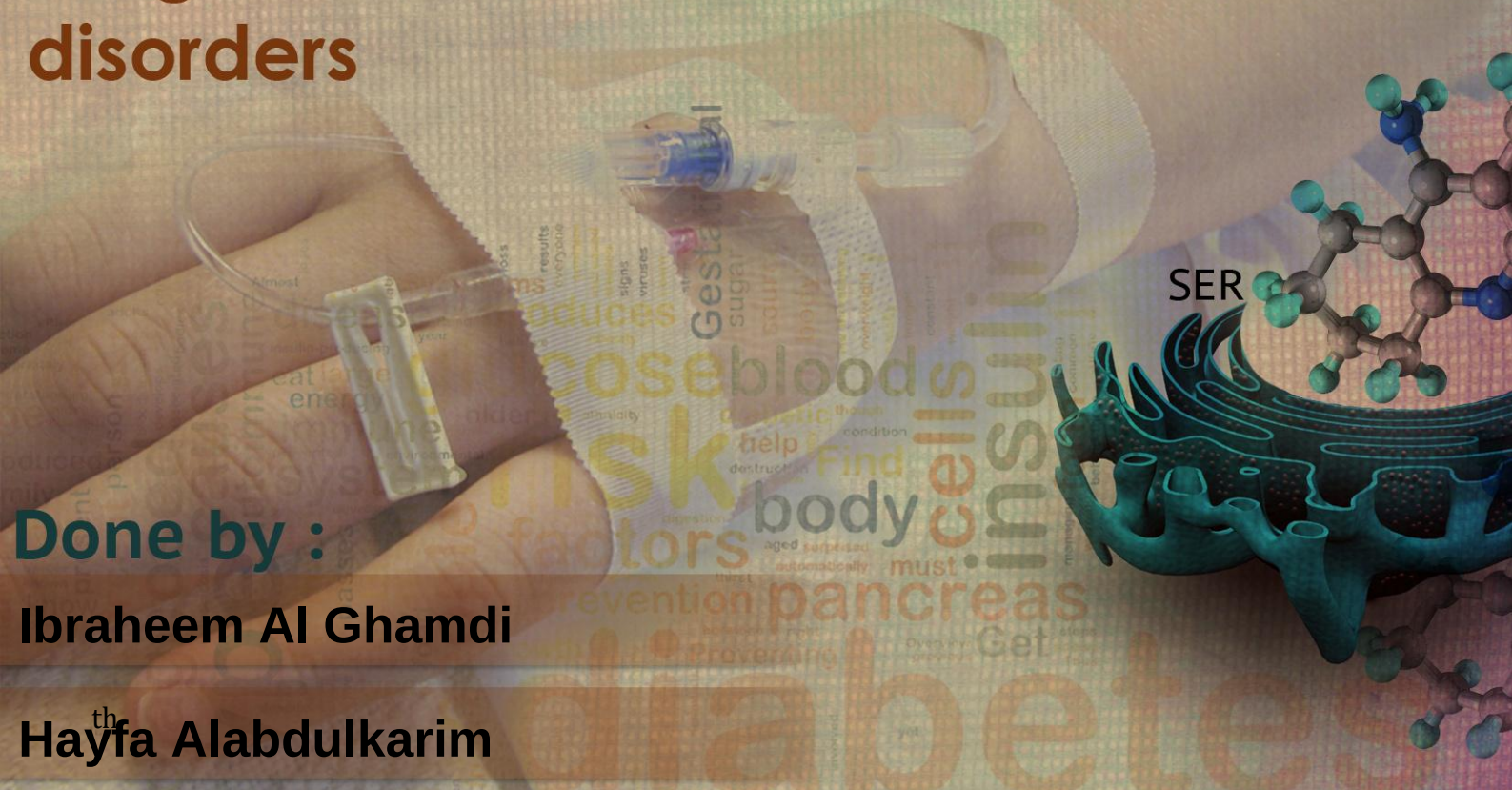
431 Teams
medical students

PT 431 Team
Pharmacology

Endocrine block

Lecture 3

Drugs used in calcium and vitamin D disorders



Done by :

Ibraheem Al Ghamdi

Hayfa Alabdulkarim

Introduction

Bones undergo continuous remodeling process "resorption and formation"
The dominant storage of calcium in our body is the bones "99%"

Principle factors involved in calcium metabolism and bone remodeling:

1- Parathyroid hormone "PTH" play central roles

2- Vitamin D

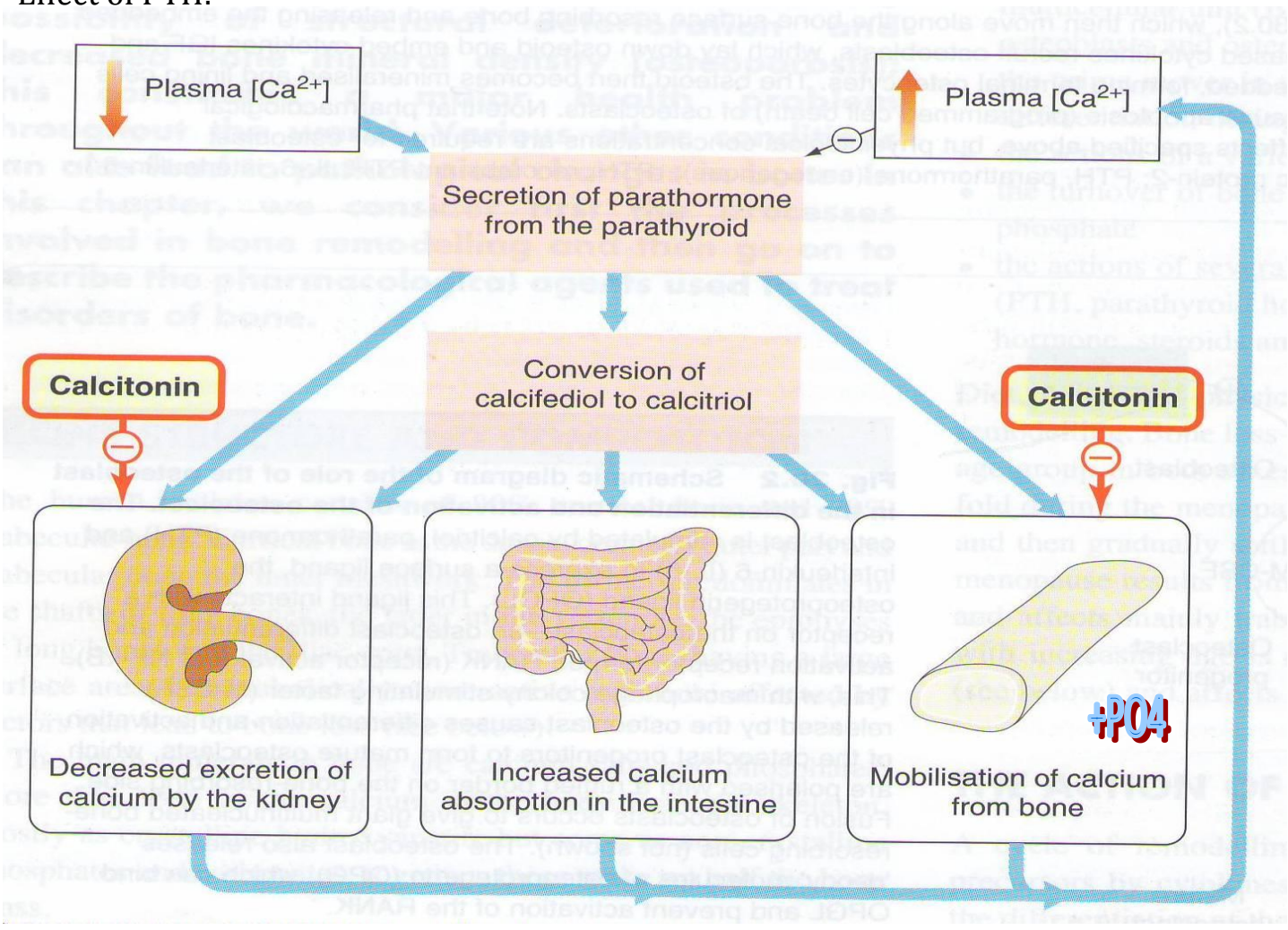
3- Teriparatide

4- Calcitonin

The target tissues "main site of action" of PTH and vitamin D are; bones, kidneys and intestines

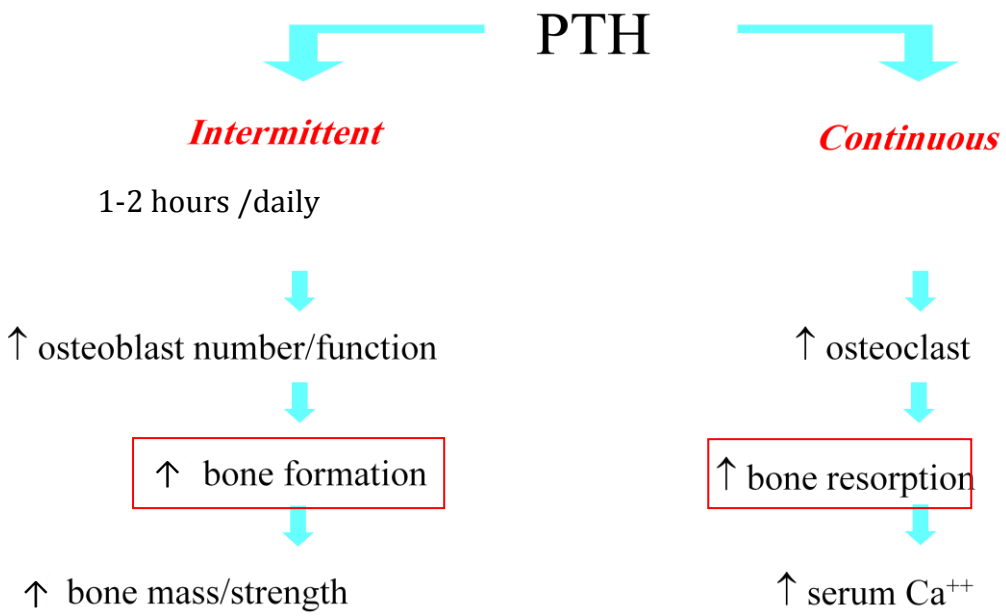
1. Parathyroid hormone (PTH)

Effect of PTH:



+ Increase excretion of PO4, participate in "calcitriol" formation

Administration of PTH:



*continuous excess of PTH , as occurs in hyperparathyroidism, may be detrimental to the skeleton because bone resorption stimulated more than bone formation.

Clinical uses of PTH:

1- Treatment of severe osteoporosis

2- Resistance cases

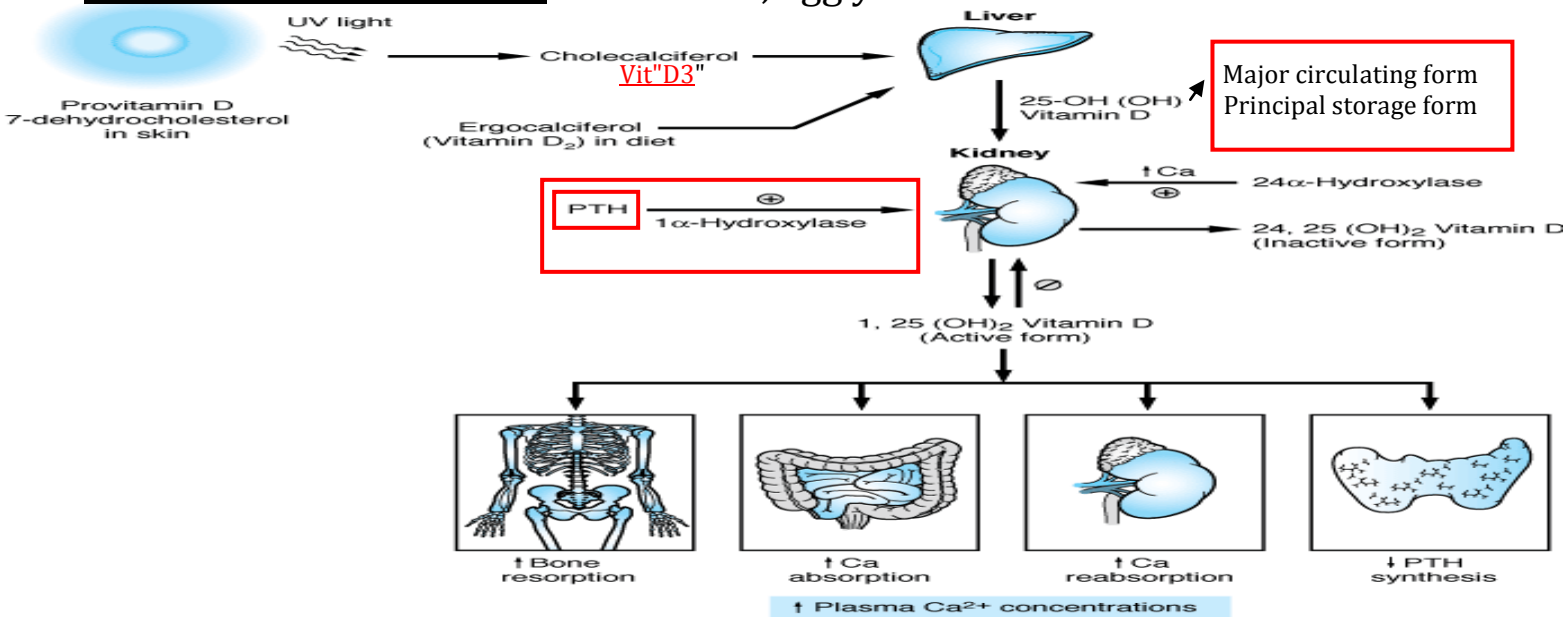
"not the drug of choice in treating osteoporosis only if: very sever or if there is a resistant to other drugs"

2. Vitamin D

Cholecalciferol (D3) "skin" and Ergocalciferol (D2) have equal biological activities

both D3 and D2 travel to the liver and then converted to active form in the kidneys

***Sources of Vitamin D2:** in diet Milk, egg yolk or fish oils



*The picture above explains the sources, metabolism and effect of vitamin D
*Note: 25-OH-cholecalciferon also called "Calcifediol"

3. Teriparatide

Synthetic PTH analogue , Given once/daily, subcutaneous injection

Clinical uses of teriparatide:

1- **Shouldn't be used routinely due to carcinogenic effects**
2- For treatment of osteoporosis in people who have a risk of getting fracture (it increases bone mass and strength) "specially for hypogonadal osteoporosis in men"
3- Good for postmenopausal osteoporosis

Side effect of teriparatide:

- **Carcinogenic effect (osteosarcoma)**
- **Diarrhea, heart burn, nausea**
- **Headache, leg cramps**
- **Postural hypotension**
- **Kidney stones, ↑ serum Ca**

Paget's disease of bone is a chronic disorder that can result in enlarged and misshapen bones.

Contraindication of teriparatide:

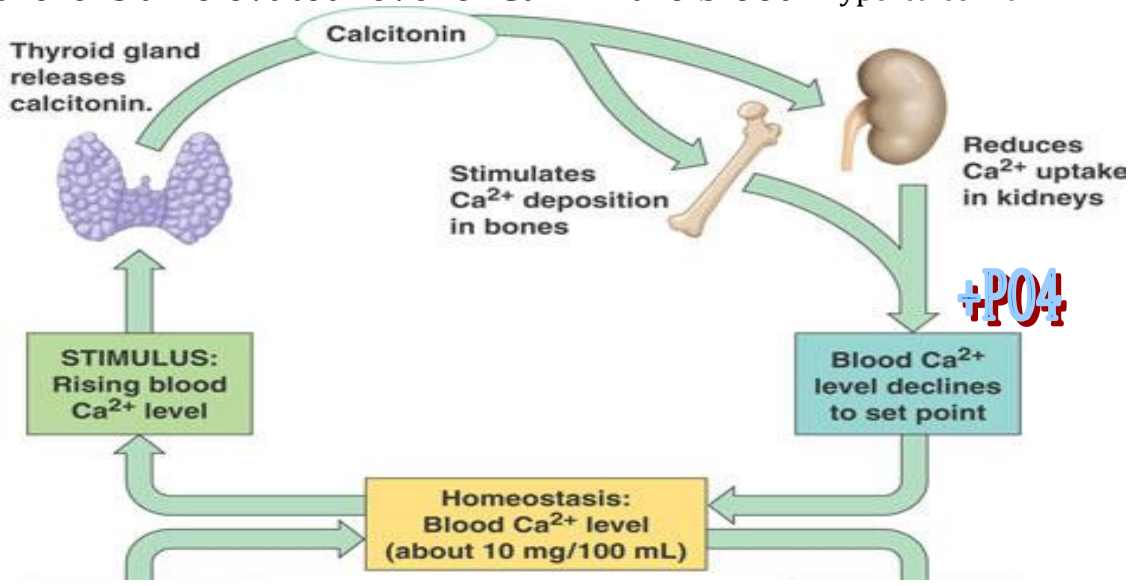
People with increased risk of bone tumors such as

- **People with paget's disease of bone**
- **People who had radiation treatment involving bones**
- **Children not recommneded**

4. Calcitonin

It is released when there is an elevated level of Ca^{2+} in the blood "hypercalcemia"

Calcitonin does not appear to be critical for the regulation of calcium homeostasis even if thyroid gland is removed



Clinical uses of Calcitonin:

Osteoporosis + Hypercalcemia

Route of administration:

Nasal spary (Calcitonin Salmon) or S.C

Side effect of calcitonin:

- Nausea
- local inflammation (injection)
- Flushing of face & hands
- Nasal irritation

SUMMARY

Bones undergo continuous remodeling process "resorption and formation"

The dominant storage of calcium in our body is the bones "99%"

Principle factors involved in calcium metabolism and bone remodeling: Parathyroid hormone "PTH", Vitamin D, Teriparatide and Calcitonin

Effect of PTH include mobilization of Ca & PO4 from bone in response to hypocalcemia, ↑ of Ca reabsorption and formation of calcitiol in kidney, indirectly ↑ Ca absorption from GIT

Administration of PTH **is intermittent not continuous** continuous exposure of PTH, as occurs in hyperparathyroidism, may be detrimental to the skeleton because bone resorption stimulated more than bone formation, Clincal uses of PTH in osteoporosis and resistance cases

Cholecalciferol (D3) synthesizes in skin, while Ergocalciferol from palnts, both of equally active (D3) & (D2) go to live for conversion to (Calcifediol) the most circulating form and major storage form , then they converted into active form "calcitriol" and PTH is important for that

Effect of Vit.D: activation of osteobalst, ↑reabsorption of Ca & PO4 from kidney & Ca absorption in GIT

Teriparatide is synthetic form of PTH, given as subcutaneous injection

Therapeutic uses of teriparatide: osteoporosis, resistance cases, osteoporosis in ppl with risk of bone fracture because it ↑ bone mass and strength, shouldn't be use routinely **"carcinogenic effect",** postmenopausal

S/E of teriparatide: **carcinogenic effect, so its contraindicated in ppl at risk of bone tumors "Paget's disease or bone radiation",** postural hypotension & kidney stone

Calcitonin: doesn't have major role in calcium hemeostasis

It ↑ Ca deposition in bones, ↑ Ca and PO4 excretion by kidneys

Clinical uses: osteoporosis & hypercalcemia, administration route "nasal spray"

S/E of calcitonin; nausea, nasal irritation, local inflammation "injection site' & facial & hand flushing

Questions

Q1: which one of the following anti osteoporosis drgs is contraindicated in a patient with previous osteosarcoma?

A. Vit.D Supplement
B. Calcitonin nasal spray
C. Teriparatide

Q2: Which of the following is a mechanism of action of teriparatide in treatment of osteoporosis?

A. it increase bone remodeling rate
B. it decrease serum ca by inhibition bone resorption
C. it increase intestinal absorption of phosphate
D. it decrease renal excretion of phosphate

Answers: C,B