Endocrine Diseases
Parathyroid glands

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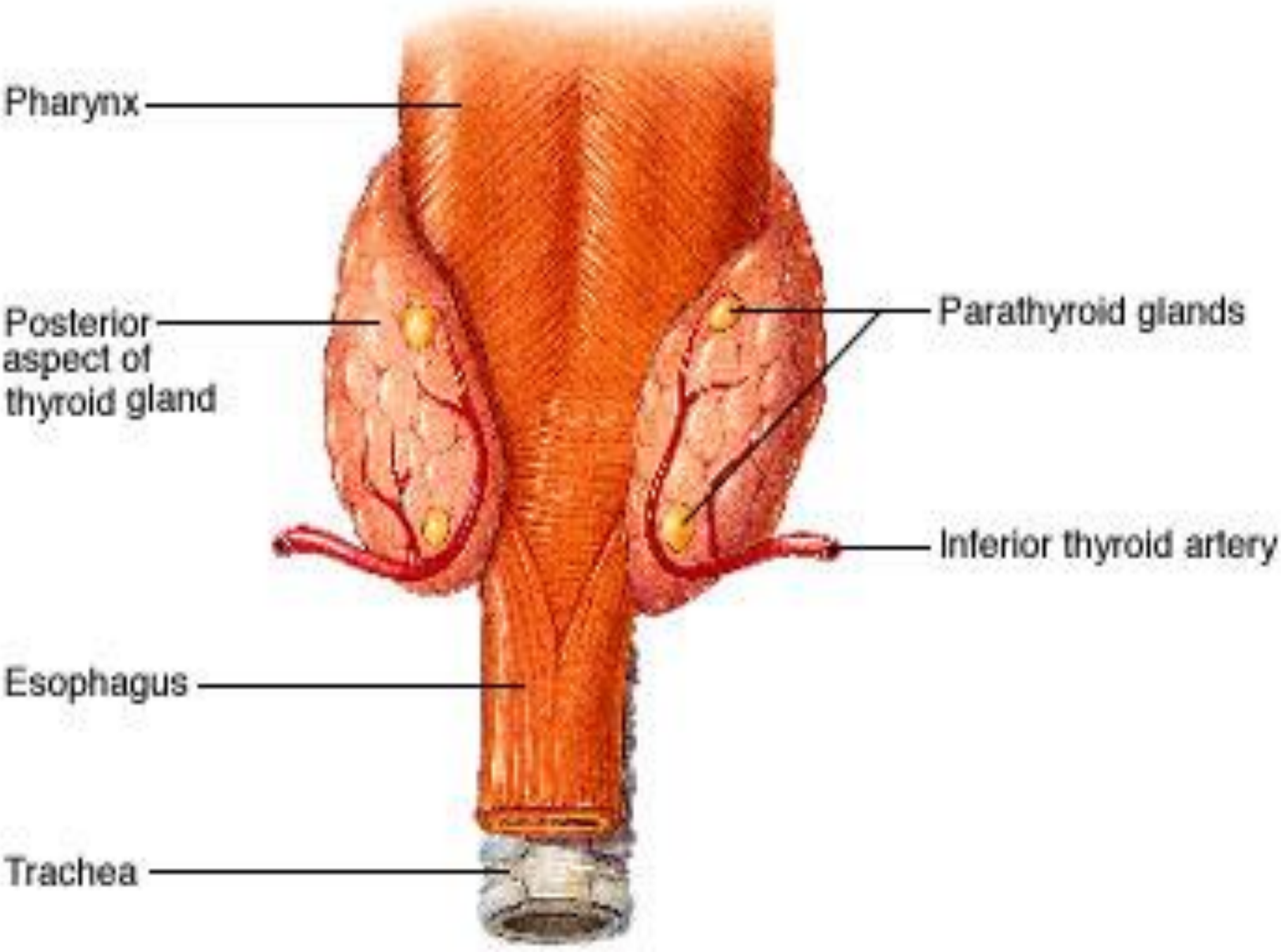
Functional anatomy and physiology

- 4 glands, behind thyroid lobes.
- Regulated by ionized serum Ca concentration.
- Parathyroid hormone (PTH);
- Single chain polypeptide,
- Secreted from chief cells in response to fall in serum ionized Ca.
- Its effect is mediated at specific membrane receptors on the target cells.


Pharynx
Posterior aspect of thyroid gland
Parathyroid glands
Inferior thyroid artery
Esophagus
Trachea

Actions of PTH

Increase plasma calcium by:

1. Increase osteoclastic activity (osteolysis); *Rapid response*.
2. Promote calcium reabsorption from renal tubules, increase excretion of phosphate.
3. Increase synthesis of 1,25 dihydroxy vit. D
4. Increase intestinal ca absorption.

Calcium Homeostasis

- Daily requirements: 20-25 mmol (800-1000mg)
- Normal serum level: 2.2-2.7mmol/L (8.5-10.5mg/dL)
- *Factors affecting Ca level*

1. Vitamin D
2. Parathyroid hormone (PTH)

↑plasma Ca, ↑renal P excretion

3. Calcitonin

Inhibits osteoclastic bone resorption

Increase renal excretion of Ca & P

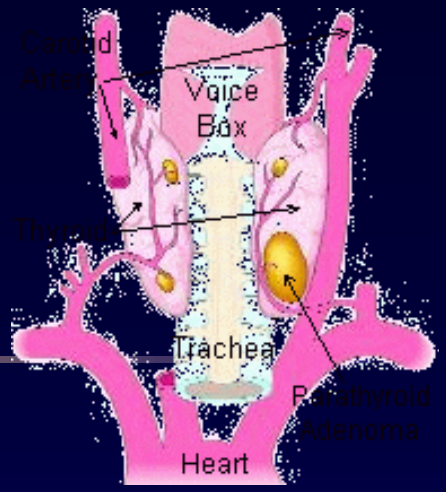
4. T3, T4

Increase bone turnover, hypercalcemia and bone loss.

Hypercalcemia; causes

1. Excessive PTH
   - Primary or tertiary hyperparathyroidism.
   - Ectopic PTH secretion
2. Malignancy
   - Myeloma - Bone metastasis.
3. Excessive vit D
   - Iatrogenic - Sarcoidosis
4. Drugs
   - Thiazides - Lithium
5. Other endocrine diseases
   - Thyrotoxicosis - Addison's disease
6. Excessive Ca intake; milk-alkali syndrome

Hyperparathyroidism



1. Primary hyperparathyroidism

- Autonomus secretion of PTH (adenoma or nodular hyperplasia)

2. Secondary hyperparathyroidism

- Hyperplasia and increase in PTH occur to compensate pronlonged hypocalcemia.

3. Tertiary hyperparathyroidism

- When secondary hyperparathyroidism prologed result in adenoma formation.

Hyperparathyroidism

Primary hyperparathyroidism

- Most common of parathyroid disorders.
- 2-3 times common in women than men.
- Common over 50ys.
- May be a part of multiple endocrine neoplasia syndromes.

Hyperparathyroidism; Clinical features

Mainly; features of hypercalcemia

1. General features;

- Polyuria, polydypsia, tiredness, malaise, dehydration, depression, lethargy, drowsiness.

2. Renal features.

- Renal colic, renal calculi, sometimes impaired renal function, hypertension is common.

3. Bones; bone pains.
4. GIT; Anorexia, nausea, dyspepsia, peptic ulceration.
5. Abdominal pain.
6. Chondrocalcinosis, ectopic calcifications

Hyperparathyroidism; Investigations

Biochemical;

- Serum calcium
- Serum phosphorus
- Serum alkaline phosphatase
4. Serum PTH
5. Renal function tests
6. TSH
7. Serum ACE

Skeletal and radiological

1. Early; demineralization, subperiosteal erosions.
2. Osteitis fibrossa
3. Soft tissue calcifications; renal, arterial walls

Hyperparathyroidism; Investigations

Localization of parathyroid adenoma

- Surgical exploration
- Ultrasonography
- Selective neck vein catheterization and PTH measurement.
- CT scanning and substraction imaging (^{201}TI)

Hyperparathyroidism; Management

Medical management

There are no effective medical therapies at present for primary hyperparathyroidism, but a high fluid intake should be maintained, a high calcium or vitamin D intake avoided, and exercise encouraged.

New therapeutic agents that target the calcium-sensing receptors (e.g. cinacalcet) are of proven value in parathyroid carcinoma and in dialysis patients, and are used in primary hyperparathyroidism where surgical intervention is contraindicated.

Surgery

Indications for surgery in primary hyperparathyroidism

- Remain controversial. There is agreement that surgery is indicated for:
- patients with renal stones or impaired renal function
- bone involvement or marked reduction in cortical bone density
- marked hypercalcaemia (> 3.0 mmol/L)
- the uncommon younger patient, below age 50 years
- a previous episode of severe acute hypercalcaemia.

Hyperparathyroidism; Management

Management of malignant hypercalcemia

1. Rehydration
2. Bisphosphonates; i.v. followed by oral
3. Additional rapid therapy may be needed as;

- Forced diuresis: saline + Frusemide
- Glucocorticoids
- Calcitonin
- Heamodialysis

4. Treatment of the cause; surgical removal of adenoma

Hypoparathyroidism & hypocalcemia

- 50% of circulating calcium is bound to organic ions as citrate, phosphate and proteins.
- The ionized part is the biologically important one.
- The level should be corrected to serum albumin. Hypoalbuminemia causes decrease in total s. Ca while ionized Ca is normal.
- Alkalosis causes a decrease in ionized Ca level while total level is normal.

Causes of Hypocalcemia

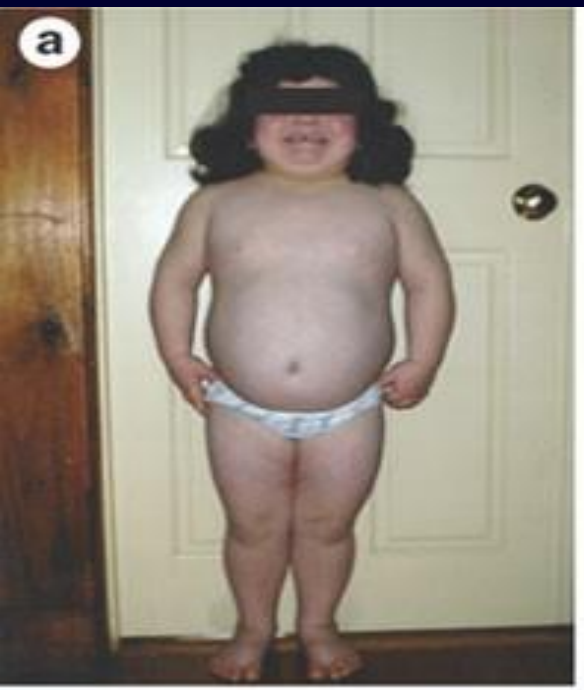
1. Alkalosis; respiratory, metabolic.
2. Hyperphosphatemia; as in chronic renal failure, phosphate therapy.
3. Hypoparathyroidism;
   - surgical removal
   - Digeorge syndrome (intellectual impairement, cataract, calcified basal ganglia)
   - Idiopathic hypoparathyroidism
4. Pseudohypoparathyroidism; autosomal dominant
5. Vit D deficiency
6. Drugs; calcitonin, bisphosphonates
7. Others; acute pancreatitis, malabsorption, citrate infusion

Pseudohypoparathyroidismis

a syndrome of end-organ resistance to PTH owing to a mutation in the GSα-protein (GNAS1) which is coupled to the PTH receptor.

It is associated with short stature, short metacarpals, subcutaneous calcification and sometimes intellectual impairment.

Variable degrees of resistance involving other G protein-linked hormone receptors may also be seen (TSH, LH, FSH).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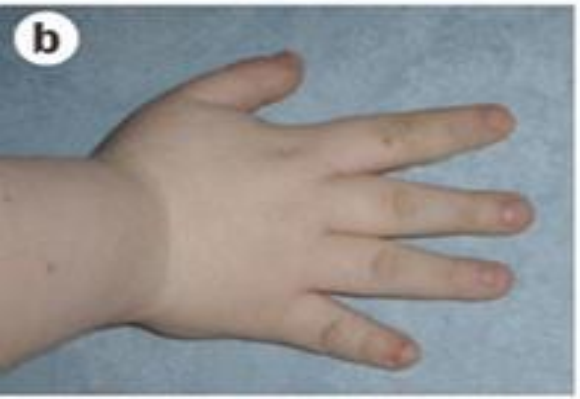
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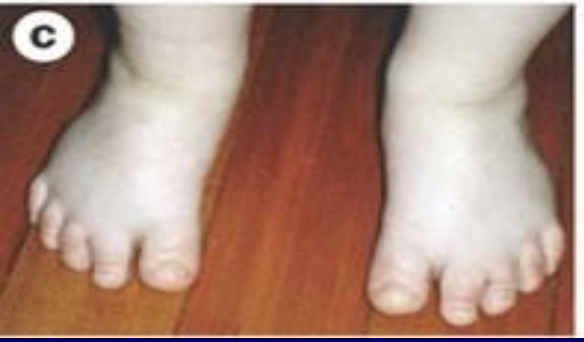
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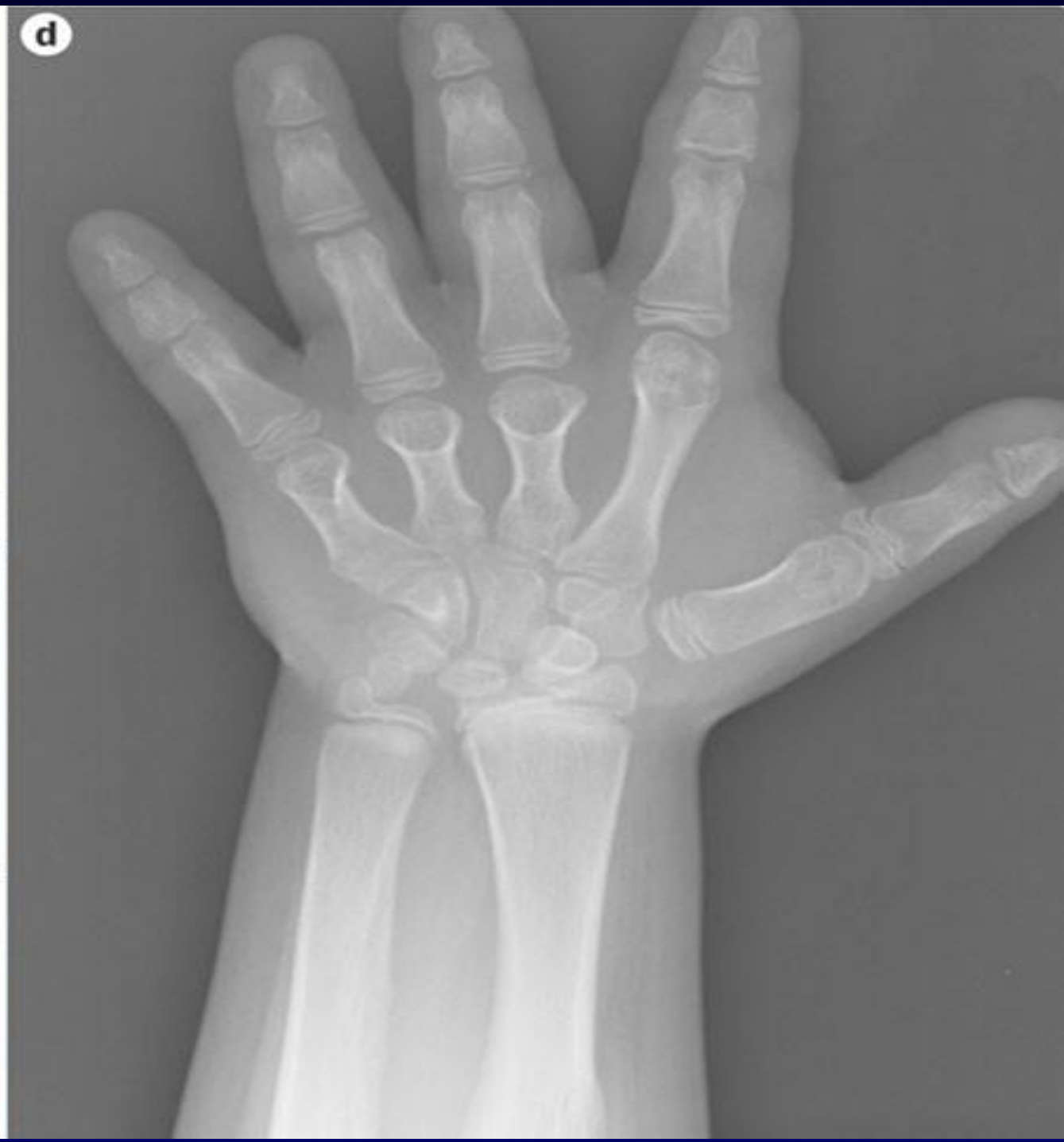
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Pseudo-pseudohypoparathyroidism

It describes the phenotypic defects but without any abnormalities of calcium metabolism.

These individuals may share the same gene defect as individuals with pseudohypoparathyroidism and be members of the same families.

Clinical features of hypocalcemia

1. Neuromuscular irritability; parasthesia, circumoral numbness, cramps, anexiety, tetany, convulsions, stridor, dystonia and psychosis.
2. Latent tetany;

- Chvostek's sign.
- Trousseau's sign,
- Erb's sign

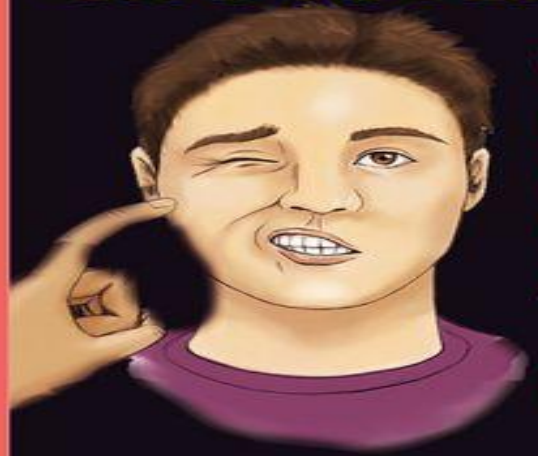
3. Other manifestations; papilledema, prolonged QT interval

Tetany

SIGNS OF HYPOCALCEMIA

NORMAL CALCIUM LEVEL 8.6-10.3 MILIIGRAM/DL

CHOVSTEK SIGN



TAPPING ON THE COURSE OF FACIAL NERVE, BETWEEN ZYGOMATIC ARCH & ANGLE OF MANDIBLE GIVES CONTRACTION OF FACIAL MUSCLES ALONG ONE SIDE OF FACE.

MEANS POSITIVE CHOVSTEK SIGN.

TROUSSEAU SIGN

BP CUFF WHEN INFLATED HIGHER THEN PERSON'S SYSTOLIC BP FOR 2 MINUTES IT GIVES SPASM OF HAND. (CARPOPEDAL SPASM)

ERB'S SIGN

HYPER-EXCITABILITY OF MUSCLE BY SUB-THRESHOLD ELECTRICAL STIMULUS CALLED ERB'S SIGN.

LARYNGEAL STRIDOR

HEARD IN CHRONIC HYPOCALCEMIA.

RJD'S MEDIX

Investigations

1. S calcium, S. Phosphorus
2. Serum magnesium
3. Renal functions
4. PTH level
5. Vit D serum level
6. Parathyroid antibodies

Management

- Urgency of management depend on severity of symptoms

1. I.v. calcium gluconate followed by oral
2. Treatment of alkalosis
3. oral Ca supplement
4. Vit D supplement; 1 α hydroxylated derivatives in renal diseases


Thank You