

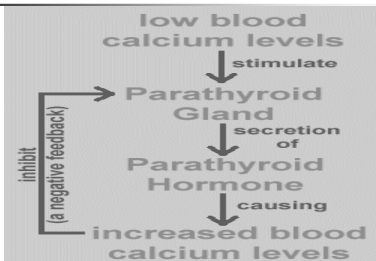
Unit 8 Problems of Regulation and Metabolism



Function of the Endocrine system

- Hormones are controlled by:
 - Negative feedback control
 - Circadian rhythms
 - Stress

Example of Negative feedback control

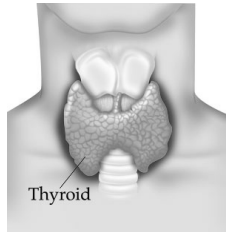


Another example of neg. feedback control

- Normal pancreas
- Insulin production
- Glucose level (serum)

Thyroid gland

- Where is it located?



Thyroid gland

- What is the thyroid gland's function?

Assessment of the Thyroid gland



Diagnostic exams to assess function of the Thyroid gland

- TRH stimulation test
- TSH stimulation test
- Serum T4
- Serum T3
- Free T4
- Thyroid scan
- Ultrasound

Hyperthyroidism vs Hypothyroidism

- | | |
|---------------------------------|-------------------------|
| ■ <u>Hyperthyroidism</u> | ■ <u>Hypothyroidism</u> |
| ■ Increased temp | ■ Cold intolerance |
| ■ Increased appetite | ■ Weight gain |
| ■ Weight loss | ■ Hypoventilation |
| ■ Anxiety | ■ Bradycardia |
| ■ Sleeplessness | ■ Goiter |
| ■ Manic behavior | ■ Hoarseness |
| ■ Wide eyed startled appearance | ■ Anemia |
| | ■ Depression |
| | ■ Non- pitting edema |

Hyperthyroidism

- Hyperthyroidism
 - Most common cause= toxic multinodular goiter
- What is Exophthalmos?
- What causes Exophthalmos?



Graves' disease is a common cause of hyperthyroidism, an over-production of thyroid hormone, which causes enlargement of the thyroid and other symptoms such as exophthalmos, heat intolerance and anxiety

Diffuse goiter

Normal thyroid
Enlarged thyroid

©ADAM

Exophthalmos



Treatment of Hyperthyroidism

- Medications:
 - PTU (Propylthiouracil)
 - Tapazole (Methimazole)
 - SSKI
 - Lugol's solution
 - Radioactive iodine therapy
- Surgery

Subtotal/total thyroidectomy

- Pre-op care
 - Euthyroid state
 - Lugols soln
 - Deep breathing and coughing

Subtotal/total thyroidectomy

- Post-op care
 - Vitals freq—especially Respirations
 - Assess for bleeding

Subtotal/total thyroidectomy

- Possible complications
 - Tetany
 - Respiratory failure
 - Hemorrhage
 - Laryngeal Nerve damage

Getting ready for the post-op thyroidectomy client

- Calcium Gluconate
- Freq. Ca levels
- Tracheostomy set at bedside
- Oxygen therapy
- Suction

Thyroid storm

- Life threatening emergency
- Usually caused by: stress, uncontrolled hyperthyroidism
- Treat symptoms

What is a goiter

- Is is a tumor?
- Why do people get goiters?

Goiter



Hypothyroidism



Hypothyroidism

- Cause:
 - Thyroid surgery
 - Radioactive iodine therapy
 - Lack of iodine—underdeveloped countries—lack in soil and water

Signs and symptoms of Hypothyroidism

- Freq. Sleeping
- Weight gain
- Low appetite
- Low body temp—cold intolerance

Signs and symptoms of Hypothyroidism

- Low Blood Pressure
- Constipation
- Goiter

Untreated Hypothyroidism leads to Myxedema Coma

- Life threatening
- Cause: stress, untreated hypothyroidism
- Appearance
 - Coarse features, edema around the eyes and face, a blank expression and a thick tongue

Treatment of Hypothyroidism

- Thyroid replacement
- Synthroid
- Final dose determined by TSH levels

Moving On



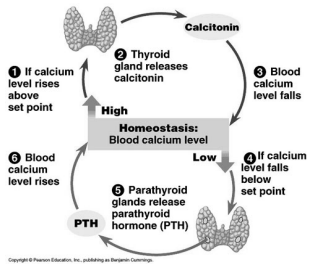
Parathyroid hormone & Calcitonin



Parathyroid hormone

- Secreted by:
 - Parathyroid Gland
- Controlled by:
 - Calcium levels
- Remember—we are talking about calcium in the serum (blood)
- Where does the calcium come from?
 - Bones
 - Urine

Relationship of Calcium and Phosphorus



Calcitonin

- When does Calcitonin get released?
 - Calcitonin decreases bone breakdown of calcium
- Remember:
 - Calcitonin ↓ calcium
 - and ↑ Phosphorus

Parathyroid Hormone (PTH)

- PTH = \uparrow Calcium levels
- PTH = \downarrow Phosphorus levels

Hyperparathyroidism

- Causes:
 - Parathyroid adenoma / carcinoma
 - Congenital hyperplasia
 - Neck trauma or radiation
 - Vitamin D deficiency
 - Chronic renal Failure
 - PTH secreting carcinomas of the lung kidney or GI tract

Hyperparathyroidism (Cont.)

- What happens (cont.)?
 - Increase calcium out of the bone and decrease calcium excretion in the urine
 - Bone fractures
 - Bone cysts
 - Osteoporosis
 - Renal calculi
 - Results in \uparrow PTH

Hyperparathyroidism (Cont.)

- What happens? (cont)
 - Peptic ulcer disease from elevated gastrin levels
 - Psychosis with mental confusion ---->coma or death

Interventions Hyperparathyroidism

- Diuretic and fluid therapy
- Phosphates
- Calcitonin
- Calcium Chelators
- Parathyroidectomy

Hypoparathyroidism

- Causes:
 - Surgical or radiation induced thyroid ablation
 - Parathyroidectomy
 - Congenital dysgenesis
 - Idiopathic (autoimmune) hypoparathyroidism
 - Hypomagnesemia—this causes impairment of PTH secretion and may decrease effectiveness of PTH on bones and kidneys

Hypoparathyroidism (cont.)

- Treatment
 - Treatment of Vitamin D deficiency
 - Treatment of Hypocalcemia
 - Treatment of Hypomagnesemia
 - Educate on diet high in calcium low in phosphorus

Results of low serum calcium

- Numbness and tingling (circumoral)
- (+) Chvostek's sign
- (+) Trousseau's sign
- Cataracts
- Mental changes
- Loss of calcium from the teeth with enamel loss

Tetany

- Trousseau's sign



Tetany

- Chvostek's sign



Nursing Diagnosis: Hypoparathyroidism -Acute

- Risk for Injury r/t: neuromuscular excitability, tetany and formation of renal stones
- Acute Pain r/t: recurrent muscle spasms altered reflexes, e/b verbal reports, distraction behaviors, narrowed focus
- Risk for ineffective airway clearance r/t: spasm of the laryngeal muscles
- Anxiety r/t: change in health status, physiologic responses

Diabetes

- Review of Diabetes Type I and II
- DKA
- HONK

Diabetes

- Type I
 - Usually presents in young patients
 - Genetic, autoimmune, and/or viral factors cause pancreatic beta islet cell destruction leading to insulin deficiency
 - Hyperglycemia occurs and can progress to ketoacidosis if insulin isn't given
 - Symptoms are polyuria, weight loss, fatigue

Treatment of Diabetes

- Blood sugar goal
- Type I
 - Insulin
- Review types of insulin
 - Reg, NPH, Lente, Iletin—(beef, pork)-no longer available

Diabetes

- Type II
 - Occurs in older adults
 - Insulin production may be OK, but the cells are insulin resistant
 - Has genetic ties, but diet and obesity determine the age of onset
 - Treated with diet, oral hypoglycemics, and insulin
- Other causes of diabetes: malnutrition, pancreatitis, endocrine dx, steroid use

Treatment of Diabetes

- Type II
 - Oral hypoglycemic agents:
 - Sulfonylurea agents—stimulates insulin production out of the pancreas eg: Glipizide
 - Biguanides -lowers glucose by decreasing release of glucose out of the liver, and decreases cell resistance eg:Glucophage

Diabetes

- Stress-induced hyperglycemia
 - Can occur in any critically ill patient
 - Tight control of blood sugar with insulin improves survival
- Hypoglycemia
 - Occurs when BS is <70'ish
 - Suspect in any patient with a sudden change in mental state or neurologic fx
 - Can be caused by a problem with diabetic tx
 - Can also be caused by a variety of other conditions
 - Malnutrition
 - Systemic dx (liver dx, sepsis, infection, hypothermia, adrenal failure, hypopituitarism)
 - Poisoning/drug toxicity
 - Insulin-secreting tumors

Diabetes

- Hypoglycemia
 - Clinical features:
 - Tremor/sweating
 - Progressive confusion
 - Seizures
 - Coma/irreversible neurologic damage
 - Treatment
 - Glucose drink or carb snack if conscious
 - IV glucose if unconscious

Diabetic Ketoacidosis

- Diabetic ketoacidosis
 - Occurs with type I diabetes usually from infection, MI, or pancreatitis
 - Insulin deficiency prevents the cells from taking glucose up...the kidneys excrete glucose as it builds up in the blood which takes water with it...in the meantime, the cells begin to metabolize fat for energy, which produces ketoacids
 - Clinical presentation: hyperventilation and hypotension/hypoperfusion

DKA video

- <http://www.youtube.com/watch?v=MA0eKCT8Leg>

DKA

- Essentials of Diagnosis
 - Acidosis with blood pH <7.3
 - Serum bicarbonate < 15mEq/L
 - Serum positive for ketones
 - Elevated anion gap
 - Hyperglycemia greater than 250mg/dl
 - No correlation between severity of hyperglycemia and severity of ketoacidosis

DKA

- Insulin Replacement
- Fluid Replacement
- Sodium Bicarbonate
- Potassium
- Phosphate
- Treatment of Associated Infection

DKA

- Break down of fats causes ketone formation.
- Ketone formation results in acidosis
- Ph= less 7.35, decreased HCO_3
- Lack of energy—no glucose for the cells

DKA

- Kussmaul respirations is a compensatory mechanism
- K will be high during dehydration
- Dump ketones in the urine because of fat breakdown

DKA

Lab values

- ABG—metabolic acidosis
- High serum glucose= 250's-400
- Chemistry: ↓ CO₂ (bicarb)
- K—may be high at the beginning, then low
- BUN ↑; Creatinine < 2.0
- Calculated osmolarity ↑

Complications of Diabetes

- Microvascular- retinopathy, neuropathy, nephropathy
- Macrovascular—CVA, MI, cardiovascular disease

Nursing diagnosis for the diabetic

- Impaired tissue perfusion
- High risk for injury
- Knowledge deficit
- Altered thought process
- High risk for fluid volume deficit
- Altered nutrition

Potential Complications for the diabetic

- PC: hypoglycemia
- PC: electrolyte imbalance
- PC: hypovolemic shock
- PC: renal failure
- PC: blindness
- PC: DKA
- PC: HONK

Nursing interventions for Diabetic clients

- Look them up
 - Avoid delegated interventions

HONK

- Hyperosmolar non-ketotic coma (HONK)
 - Less common than DKA but has much higher mortality (~50%)
 - Occurs in elderly patients with Type II who have sufficient insulin production to prevent fat metabolism but not hyperglycemia
 - Osmotic diuresis leads to dehydration and hyperosmolality, but not ketoacidosis

HONK

- HONK
 - Clinical features: anorexia, malaise, polyuria, weakness, confusion, seizures, coma
 - Diagnosis is based on blood sugar and hyperosmolality
 - Management
 - Rehydration with NS but more gradually than with DKA
 - Anticoagulants to prevent dehydration-induced emboli
- Lactic acidosis
 - Occurs in Type II diabetics treated with Glucophage

HONK

- Treatment
 - Same as DKA, but mostly hydration
- Labs
 - Same as DKA, but glucose will be from 400-800 and above.

DKA vs HONK aka HHNS

- | | |
|---|---|
| ■ Diabetic Ketoacidosis | ■ Hyperglycemic Hyperosmolar State |
| <ul style="list-style-type: none">▪ Hyperglycemia greater than 250 mg/dL▪ Acidosis; pH less than 7.3▪ Serum bicarb less than 15▪ Serum Ketones | <ul style="list-style-type: none">▪ Hyperglycemia greater than 600mg/dL▪ Serum Osmolality greater than 310▪ No Acidosis; pH greater than 7.3▪ Serum Bicarb greater than 15▪ Normal anion gap less than 14 |
