Thyroid and Parathyroid Disorders

Thyroid and Antithyroid Drugs
Thyroid Gland

Located in the neck in front of the trachea. It is a highly vascular gland that secretes 2 hormones.
Thyroid Gland

- Secretes hormones thyroxine (T_4) and triiodothyronine (T_3)
- Iodine is an essential element in hormone production
- Activity regulated by thyroid-stimulating hormone (TSH)
Age Related Changes

- Increased incidence of thyroid nodules
- Serum levels of $T_4$ remain approximately the same in a healthy older person, but levels of $T_3$ often decline
- Incidence of hypothyroidism increases with age, especially among women
Assessment of the Thyroid Gland

- Health history
  - Changes in energy level, sleep patterns, personality, mental function, emotional state
  - Unexplained weight changes
  - In the review of systems, changes in menstrual cycles, sexual function, hydration, bowel elimination pattern, and tolerance of heat and cold
Assessment of the Thyroid Gland

- Physical examination
  - Vital signs and height and weight
  - Facial expression and characteristics as well as mental alertness
  - Inspect/palpate skin for moisture, temperature, texture
  - Hair texture
  - Examine the eyes for exophthalmos (bulging)
  - Inspect the neck for enlargement typical of goiter. Observe the hands for tremor
Assessment of the Thyroid Gland

- Diagnostic tests and procedures
  - Serum $T_3$, free $T_4$, $T_4$, and TSH
  - Thyroid-releasing hormone (TRH) stimulation test
  - Radioactive iodine (RAI) uptake test
  - Thyroid ultrasonography
  - MRI or CT
Two Diseases Related to Hormone-Producing Activity

Hypothyroidism
Hyperthyroidism
Characteristics of Hyperthyroidism

- Abnormally increased synthesis and secretion of thyroid hormones

Graves’ disease

- Most common type of hyperthyroidism
- Autoimmune disorder
- Antibodies activate TSH receptors, which in turn stimulate thyroid enlargement and hormone secretion
- Most often develops in young women
Multinodular Goiter

- Often in women in their 60s and 70s
- Likely develop in people who have had goiter for a number of years
- Caused by small thyroid nodules that secrete excess thyroid hormone
- Increased hormone production is independent of TSH
- Nodules can be benign or malignant
- Symptoms are usually less severe
Signs and Symptoms

- Weight loss and nervousness with a mild form
- In more severe cases
  - Restlessness, irritable behavior, sleep disturbances, emotional lability, personality changes, hair loss, and fatigue
  - Weight loss, even when the patient is eating well, is common
  - Poor tolerance of heat and excessive perspiration
  - Changes in menstrual and bowel patterns
  - Warm, moist, velvety skin; fine hand tremors; swelling of the neck; and ophthalmopathy including exophthalmos
  - Tearing, light sensitivity, decreased visual acuity, and swelling around orbit of the eye
  - Tachycardia, increased systolic blood pressure, sometimes atrial fibrillation
Complications

- **Thyrotoxicosis**
  - Excessive stimulation caused by elevated thyroid hormone levels that produce dangerous tachycardia and hyperthermia
Medical Diagnosis

Decreased TSH and elevated serum $T_4$

Measurement of thyroid-stimulating antibodies and results of a radioactive iodine uptake test to diagnose Graves’ disease
Medical Treatment

- Drug therapy
  - Antithyroid drugs
    - Thionamides and iodides
- Radioactive iodine
  - Accumulates in the thyroid gland, where it causes destruction of thyroid tissue
- Surgical treatment
  - Subtotal thyroidectomy
Antithyroid Drugs

Also called thyroid antagonists; used to treat hyperthyroidism and before surgery to decrease bleeding tendency
Antithyroid Drugs

- **Examples**—methimazole, propylthiouracil
- **Action**—inhibit thyroid hormone manufacture
- **Adverse Reactions**—agranulocytosis, hay fever, sore throat, skin rash, fever, headache, nausea, vomiting, paresthesias
Antithyroid Drugs

- Propylthiouricil (PTU)
  - Indications
  - Baseline data
  - Minimizing adverse Effects
  - Monitoring
  - Patient teaching
Radioactive Iodine

- Used to treat hyperthyroidism and thyroid cancer
- Act to destroy thyroid cells without damaging other body cells
- Swelling of the neck, sore throat, nausea, vomiting, cough and pain on swallowing, bone marrow depression
Antithyroid Drugs

- Strong Iodine Solution (Lugol’s Solution)
- Goals
- Baseline Data
- Administration
- Minimizing Adverse Effects
Hypothyroidism

- Inadequate secretion of thyroid hormones
- Cretinism
  - If not treated early, hypothyroidism during infancy causes permanent physical and mental retardation
- In adults can be serious but usually reversible with treatment
- Myxedema
  - Facial edema from severe, long-term hypothyroidism
Etiology and Risk Factors

Primary
- Atrophy of the thyroid gland after years of Graves’ disease or thyroiditis
- Treatment for hyperthyroidism
- Dietary iodine deficiency
- High intake of goitrogens
- Defects in thyroid hormone synthesis

Secondary
- Pituitary or hypothalamic disorders
- Thyroidectomy
Signs and Symptoms

- Swelling of the lips and eyelids
- Dry, thick skin
- Bruising
- Thin, coarse hair
- Hoarseness
- Generalized nonpitting edema
- Facial edema
- May seem slow, depressed, or apathetic
Medical Diagnosis

- Based on laboratory determination of free T₄ and TSH

- Complications
  - Myxedema coma

- Medical treatment
  - Hormone replacement therapy
    - Levothyroxine (Synthroid) or liothyronine (Cytomel)
Myxedema coma

- Most severe form of hypothyroidism
- Etiology: Infection, infection, exposure to cold, medications
- Untreated may end in death
Thyroid Hormones

- Liotrix
- Thyroid (Desiccated, Armour Thyroid)
Thyroid Hormones

- Example—levothyroxine
- Act to increase metabolic rate
- Uses—replacement therapy in hypothyroidism, euthyroid creation, thyrotoxicosis
- Adverse Reactions—palpitations, tachycardia, nervousness, headache, insomnia, diarrhea
Simple Goiter

Thyroid enlargement with normal hormone production

- Causes
  - Iodine deficiency and long-term exposure to goitrogens
  - The gland may enlarge to compensate for hypothyroidism
  - Sometimes the enlarged gland produces excess hormones, making the patient hyperthyroid
Simple Goiter

Treatment

- If mild enlargement and normal hormones, no intervention
- Some patients need hormone replacement therapy
- Surgery indicated if pressure on the trachea or esophagus or if the condition is disfiguring
Goiter

Nodules

- Can be benign or malignant
- Physician may order a scan that uses radioactive iodine; determines cancer
- Nodular goiters usually surgically removed
- In benign conditions, only the nodule may be removed
Thyroid Cancer

- Uncommon
  - Fatal in less than 1% of all cases
  - Early stages: nodule that can be felt on thyroid

- If cancer spreads, enlarged lymph nodes felt in the neck
- Patient may not show dramatic changes in thyroid hormone levels
- Total thyroidectomy is the usual treatment
  - If malignancy spreads beyond thyroid gland, more radical surgery may be indicated
Parathyroid Glands

- Small glands located on back of thyroid
  - Occasionally found in the mediastinum as well
- Usually 4 parathyroids; some people have more
- Embedded in thyroid, but function independently
- Secrete only one hormone, but it is vital
  - Parathyroid hormone, or parathormone (PTH), plays a critical role in regulating the serum calcium level
Nursing Assessment

Health history

- Change in mental-emotional status, such as memory problems, irritability, or personality changes
- Musculoskeletal problems, including weakness, skeletal pain, backache, and muscle twitching or spasms
- Urinary frequency, polyuria, urinary calculi (stones), or constipation
- Head/neck radiation, renal calculi, chronic renal failure
- Medications, including calcium and vitamin D supplements
Nursing Assessment

- Physical examination
  - Heart rate and rhythm, blood pressure, respiratory effort, muscle strength, muscle twitching, and hair and skin texture
  - Chvostek’s sign
    - Spasm of facial muscle when facial nerve tapped
  - Trousseau’s sign
    - Carpopedal spasm when a blood pressure cuff is inflated above the patient’s systolic blood pressure and left in place for 2 to 3 minutes
Diagnostic Tests and Procedures

Blood tests
- Calcium, phosphate, creatinine, uric acid, magnesium, alkaline phosphatase, and PTH

- Radiographs
- Dental examination
- Electrocardiogram
Hyperparathyroidism

- Secretion of excess parathormone (PTH)

Causes

- Tumor (an adenoma); can be benign or malignant
- Vitamin D deficiencies, malabsorption, chronic renal failure, and elevated serum phosphate

- Elevation of serum calcium (hypercalcemia)

- High levels of PTH cause calcium to shift from the bones into the bloodstream
  - If untreated, severe demineralization of bone tissue
Signs and Symptoms

- Symptoms vague at first
  - Weakness, lethargy, depression, anorexia, and constipation

- Other findings include mental and personality changes, cardiac dysrhythmias, weight loss, and urinary calculi
Medical Diagnosis

- Elevated serum calcium and decreased serum phosphate
  - Elevated PTH and 24-hour urine calcium
  - Skeletal radiographs and bone density studies
  - CT, MRI, ultrasound, fine-needle aspiration, and selective arteriography
Medical Treatment

- Surgical intervention
  - Parathyroidectomy
  - Surgeon attempts to leave some parathyroid tissue to prevent hypoparathyroidism
Medical Treatment

Drug therapy

- Sodium and phosphorus replacements
- Calcitonin (Calcimar), gallium nitrate (Ganite), bisphosphonates (etidronate, pamidronate), and plicamycin (Mithracin) inhibit release of calcium from bones
- Furosemide (Lasix): promotes excretion of calcium in the urine
- Propranolol reduces PTH secretion
Assessment

- Monitor vital signs, urine output, weight, muscle strength, bowel elimination, and digestive disturbances
Postoperative Care

- Airway obstruction from accumulated fluid and blood in surgical site compressing the trachea
  - Monitor and document the respiratory rate and effort and the pulse rate
  - Increasing pulse and respiratory rates, especially accompanied by restlessness, suggest inadequate oxygenation
  - Notify physician of indications of respiratory distress
  - Keep an emergency tracheotomy tray at the bedside in the event of acute obstruction
Postoperative Care

- Airway obstruction related to severe hypocalcemia
- Be alert for tetany
  - Tingling around mouth and in the fingers
  - It may progress to severe muscle spasms or cramps and even to laryngospasm
  - Treated with oral or intravenous calcium supplements
Postoperative Care

- Protect suture line from stress
- Show patient how to support the head when changing positions
- Inspect dressing and back of the neck for bleeding
- Elevate patient’s head to reduce swelling
Hypoparathyroidism

- Deficiency of parathormone (PTH)
- Uncommon condition
- From accidental removal of/damage to parathyroid glands during surgery
- Primary hypoparathyroidism can be caused by an autoimmune process and by several conditions, including Wilson’s disease (copper overload)
- Inadequate secretion of PTH leads to hypocalcemia
  - Severe hypocalcemia can progress to convulsions and respiratory obstruction due to spasms of the larynx
Hypoparathyroidism

- Signs and symptoms
  - Painful muscle cramps, fatigue and weakness, tingling and twitching of the face and hands, mental and emotional changes, dry skin, and urinary frequency
  - With severe hypocalcemia, difficulty breathing, convulsions, and cardiac dysrhythmias
Hypoparathyroidism

- Medical diagnosis
  - Low serum calcium, elevated serum phosphate, low urine calcium, and sometimes low serum magnesium
  - Chvostek’s sign and Trousseau’s sign
- Medical treatment
  - Acute hypoparathyroidism: sometimes parenteral PTH
  - Severe hypocalcemia: with intravenous calcium salts
  - Chronic hypoparathyroidism: with oral calcium salts and a form of vitamin D
Hypoparathyroidism

- Interventions
  - Administer drugs as ordered
  - If recent seizure activity or if patient shows severe neuromuscular irritability, follow seizure precautions
  - Pulse/blood pressure for dysrhythmias/heart failure
  - Teach signs and symptoms of calcium imbalances, and provide instructions for self-medication
  - Advise patient to carry medical ID card to alert health care providers in event of an emergency