UNIT 9
Endocrine and Nervous Systems
Pathological Conditions
The Endocrine System

HYPOTHALAMUS
Production of ADH, oxytocin, and regulatory hormones

PITUITARY GLAND
Anterior lobe: ACTH, TSH, GH, PRL, FSH, LH, and MSH
Posterior lobe: Release of oxytocin and ADH

PARATHYROID GLANDS
(on posterior surface of thyroid gland)
Parathyroid hormone (PTH)

PINEAL GLAND
Melatonin

HEART
Natriuretic peptides: ANP and BNP (Chapter 21)

THYROID GLAND
Thyroxine (T4)
Triiodothyronine (T3)
Calcitonin (CT)

KIDNEY
Renin
Erythropoietin (EPO)
Calcitriol
(Chapters 13 and 27)

THYMUS
(Undergoes atrophy during adulthood)
Thymosins
(Chapter 22)

ADIPOSE TISSUE
Leptin
Resistin

ADRENAL GLANDS
Each adrenal gland is subdivided into:
Adrenal medulla:
Epinephrine (E)
Norepinephrine (NE)
Adrenal cortex:
Cortisol, corticosterone, aldosterone, androgens

DIGESTIVE TRACT
Numerous hormones (detailed in Chapter 24)

PANCREATIC ISLETS
Insulin, glucagon

GONADS
Testes (male):
Androgens (especially testosterone), inhibin
Ovaries (female):
Estrogens, progestins, inhibin

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The Endocrine System (cont’d)
The Endocrine System

Signs, Symptoms, and Diseases
ADDISON DISEASE

- Relatively uncommon chronic disorder caused by deficiency of cortical hormones that results when the adrenal cortex is damaged or atrophied.
  - Atrophy of adrenal glands is usually the result of an autoimmune process in which circulating adrenal antibodies slowly destroy the gland.
CUSHING SYNDROME

- Cluster of symptoms caused by excessive amounts of cortisol or adrenocorticotropic hormone (ACTH) circulating in the blood.

- Most cases of Cushing syndrome are caused by administration of glucocorticoids in the treatment of immune disorders, such as asthma, rheumatoid arthritis, and lupus erythematosus.
Chronic metabolic disorder of impaired carbohydrate, protein, and fat metabolism due to insufficient production of insulin or the body’s inability to utilize insulin properly.

When used alone, the term diabetes refers to diabetes mellitus. Hyperglycemia and ketosis are responsible for its host of troubling and commonly life-threatening symptoms. Diabetes mellitus occurs in two primary forms: type 1 diabetes and type 2 diabetes.
TYPE 1 DIABETES

- Form of diabetes mellitus that is abrupt in onset and is due to the failure of the pancreas to produce insulin, making this type of disease difficult to regulate.
  
  - Type 1 diabetes is usually diagnosed in children and young adults. Treatment includes insulin injections to maintain a normal level of glucose in the blood.
Form of diabetes mellitus that is gradual in onset and results from the body’s deficiency in producing enough insulin or resistance to the action of insulin by the body’s cells.

Type 2 is the most common form of diabetes. It is usually diagnosed in adults older than age 40. Management of this disease is less problematic than that of type 1. Treatment includes diet, weight loss, and exercise. It may also include insulin or oral antidiabetic agents, which activate the release of pancreatic insulin and improve the body’s sensitivity to insulin.
EXOPHTHALMOS

- Abnormal protrusion of the eyeball(s), possibly due to thyrotoxicosis, tumor of the orbit, orbital cellulitis, leukemia, or aneurysm.
GRAVES DISEASE

- Multisystem autoimmune disorder that involves growth of the thyroid (hyperthyroidism) associated with hypersecretion of thyroxine; also called exophthalmic goiter, thyrotoxicosis, or toxic goiter.

  - Graves disease is characterized by an enlarged thyroid gland and exophthalmos (bulging of the eyes), which develops because of edema in the tissues of the eye sockets and swelling of the extrinsic eye muscles.
INSULINOMA

- Tumor of the islets of Langerhans; also called a *pancreatic tumor*. 
Advanced hypothyroidism in adults that results from hypofunction of the thyroid gland and affects body fluids, causing edema and increasing blood volume and increasing blood pressure.
OBESITY

- Excessive accumulation of fat that exceeds the body’s skeletal and physical standards, usually an increase of 20% or more above ideal body weight.
  - Obesity may be due to excessive intake of food (exogenous) or metabolic or endocrine abnormalities (endogenous).
MORBID OBESITY

- Body mass index (BMI) of 40 or greater, which is generally 100 lb or more over ideal body weight.
  - Morbid obesity is a disease with serious psychological, social, and medical ramifications and one that threatens necessary body functions such as respiration.
PANHYPOPITUITARISM

- Total pituitary impairment that brings about a progressive and general loss of hormone activity.
PHEOCHROMOCYTOMA

- Small chromaffin cell tumor, usually located in the adrenal medulla.
PITUITARISM

- Any disorder of the pituitary gland and its function.
The Nervous System

Signs, Symptoms, and Diseases
ALZHEIMER DISEASE

- Chronic, organic mental disorder that is a progressive form of presenile dementia caused by atrophy of the frontal occipital lobes of the brain.

  - The onset of Alzheimer disease is usually between ages 40 and 60. It involves progressive irreversible loss of memory, deterioration of intellectual functions, apathy, speech and gait disturbances, and disorientation. The course may take from a few months to 4 or 5 years to progress to complete loss of intellectual function.
EPILEPSY

- Disorder affecting the central nervous system that is characterized by recurrent seizures.
HUNTINGTON CHOREA

- Hereditary nervous disorder caused by the progressive loss of brain cells, leading to bizarre, involuntary, dancelike movements.
HYDROCEPHALUS

- Cranial enlargement caused by accumulation of fluid within the ventricles of the brain.
MULTIPLE SCLEROSIS

- Progressive degenerative disease of the central nervous system characterized by inflammation, hardening, and loss of myelin throughout the spinal cord and brain, which produces weakness and other muscle symptoms.
NEUROBLASTOMA

- Malignant tumor composed principally of cells resembling neuroblasts.
  - Neuroblastoma occurs most commonly in infants and children.
PALSY

- Partial or complete loss of motor function; also called *paralysis*. 
BELL Palsy

- Facial paralysis on one side of the face because of inflammation of a facial nerve (cranial nerve VII), most likely caused by a viral infection.
  - Bell palsy commonly results in grotesque facial disfigurement and facial spasms. Treatment includes corticosteroid drugs to decrease nerve swelling. Ordinarily, the condition lasts a month and resolves itself.
CEREBRAL PALSY

- Bilateral, symmetrical, nonprogressing motor dysfunction and partial paralysis, which is usually caused by damage to the cerebrum during gestation or birth trauma but can also be hereditary.
PARALYSIS

- Loss of muscle function, loss of sensation, or both.
  - Paralysis may be caused by a variety of problems, such as trauma, disease, and poisoning. Paralyses may be classified according to the cause, muscle tone, distribution, or body part affected. Common causes of paralysis are spinal cord injuries and strokes.
PARKINSON DISEASE

- Progressive, degenerative neurological disorder affecting the portion of the brain responsible for controlling movement.
  - The unnecessary skeletal muscle movements of Parkinson disease commonly interfere with voluntary movement, causing the hand to shake (called tremor), the most common symptom of Parkinson disease.
Poliomyelitis

- Inflammation of the gray matter of the spinal cord caused by a virus, commonly resulting in spinal and muscle deformity and paralysis.
SCIATICA

- Severe pain in the leg along the course of the sciatic nerve, which travels from the hip to the foot.
SEIZURE

- Convulsion or other clinically detectable event caused by a sudden discharge of electrical activity in the brain that may be classified as partial or generalized.
  - Seizure is a characteristic of epilepsy.
SHINGLES

- Eruption of acute, inflammatory, herpetic vesicles caused by herpes zoster virus on the trunk of the body along a peripheral nerve.
SPINA BIFIDA

- Congenital neural tube defect characterized by incomplete closure of the spinal canal through which the spinal cord and meninges may or may not protrude.
  - *Spina bifida usually occurs in the lumbosacral area and has several forms.*
SPINA BIFIDA OCCULTA

- Most common and least severe form of spina bifida without protrusion of the spinal cord or meninges.
SPINA BIFIDA CYSTICA

- More severe type of spina bifida that involves protrusion of the meninges (meningocele), spinal cord (myelocele), or both (meningomyelocele).

  - The severity of neurological dysfunction in spina bifida cystica depends directly on the degree of nerve involvement.
Severe injuries to the spinal cord, such as vertebral fractures and dislocations, resulting in impairment of spinal cord function below the level of the injury.

Spinal cord injuries are commonly the result of trauma caused by motor vehicle accidents, falls, diving in shallow water, or accidents associated with contact sports. Such trauma may cause varying degrees of paraplegia and quadriplegia. These injuries are seen most commonly in the male adolescent and young adult population.
Paraplegia

- Paralysis of the lower portion of the body and both legs.
  
  - Paraplegia results in loss of sensory and motor control below the level of injury. Other common problems occurring with spinal cord injury to the lumbar and thoracic regions include loss of bladder, bowel, and sexual control.
QUADRIPLEGIA

- Paralysis of all four extremities and, usually, the trunk.
  - Quadriplegia generally results in loss of motor and sensory function below the level of injury. Paralysis includes the trunk, legs, and pelvic organs with partial or total paralysis in the upper extremities. The higher the trauma, the more debilitating the motor and sensory impairments will be.
TRANSIENT ISCHEMIC ATTACK

- Temporary interference with blood supply to the brain, lasting a few minutes to a few hours.
Medical and Surgical Procedures
COMPUTED TOMOGRAPHY (CT)

- Radiographic technique that uses a narrow beam of x-rays that rotates in a full arc around the patient to acquire multiple views of the body that a computer interprets to produce cross-sectional images of that body part.
  - CT scans of endocrine organs are used to assist in the diagnosis of various pathologies and may include the use of a contrast medium.
MAGNETIC RESONANCE IMAGING (MRI)

- Radiographic technique that uses electromagnetic energy to produce multiplanar cross-sectional images of the body.

  - MRI scans of the endocrine system are used to identify abnormalities of pituitary, pancreatic, adrenal, and thyroid glands.
RADIOACTIVE IODINE UPTAKE (RAIU) TEST

- Imaging procedure that measures levels of radioactivity in the thyroid after oral or IV administration of radioactive iodine.

- RAIU is used to determine thyroid function by monitoring the thyroid’s ability to take up (uptake) iodine from the blood.
CEREBROSPINAL FLUID (CSF) ANALYSIS

- Laboratory test in which CSF obtained from a lumbar puncture is evaluated macroscopically for clarity and color, microscopically for cells, and chemically for proteins and other substances.
Normal CSF is clear and colorless. CSF has a pink or reddish tint when large numbers of red blood cells (RBCs) are present. RBCs indicate bleeding in the brain from trauma or a stroke. CSF appears cloudy when large numbers of white blood cells (WBCs) are present. WBCs indicate an infection such as meningitis or encephalitis. Elevated protein levels indicate infection or the presence of a tumor.
COMPUTED TOMOGRAPHY (CT)

- Radiographic technique that uses a narrow beam of x-rays that rotates in a full arc around the patient to acquire multiple views of the body that a computer interprets to produce cross-sectional images of that body part.

- CT scans of the brain help in differentiating intercranial pathologies such as tumors, cysts, edema, hemorrhage, blood clots, and cerebral aneurysms. Contrast mediums also may be injected intravenously.
MAGNETIC RESONANCE IMAGING (MRI)

- Radiographic technique that uses electromagnetic energy to produce multiplanar cross-sectional images of the body.
  - MRI of the brain produces cross-sectional, frontal, and sagittal plane views of the brain. It is regarded as superior to CT for most CNS abnormalities, particularly those of the brainstem and spinal cord. A contrast medium is not required but may be used to enhance internal structure visualization.
LUMBAR PUNCTURE

- Insertion of a needle into the subarachnoid space of the spinal column at the level of the fourth intervertebral space to withdraw cerebral spinal fluid (CSF) in order to perform various diagnostic and therapeutic procedures; also called spinal tap or spinal puncture.

  - In lumbar puncture, CSF flows through the needle and is collected and sent to the laboratory for analysis. Therapeutic procedures include withdrawing CSF to reduce intracranial pressure, introducing a local anesthetic to induce spinal anesthesia, or to administer intrathecal medications.
POSITRON EMISSION TOMOGRAPHY (PET)

- Radiographic technique combining computed tomography with radiopharmaceuticals that produces a cross-sectional (transverse) image of the dispersement of radioactivity (through emission of positrons) in a section of the body to reveal the areas where the radiopharmaceutical is being metabolized and where there is a deficiency in metabolism.

- **PET scanning aids in diagnosis of such neurologic disorders as brain tumors, epilepsy, stroke, Alzheimer disease, and abdominal and pulmonary disorders.**
ADRENALECTOMY

- Surgical removal of one or both adrenal glands to remove a benign or cancerous tumor, aid in correcting a hormone imbalance, prevent metastasis or, occasionally, prevent adrenal gland hormone excretion from exacerbating an existing condition such as breast cancer.
THYROIDECTOMY

- Excision of one lobe (subtotal thyroidectomy) or the entire thyroid gland (thyroid lobectomy).
CRANIOTOMY

- Surgical procedure that creates an opening in the skull to gain access to the brain during neurological procedures.
  - A craniotomy is also performed to relieve intracranial pressure, control bleeding, or remove a tumor.
THALAMOTOMY

- Partial destruction of the thalamus to treat psychosis or intractable pain.
HORMONE REPLACEMENT THERAPY (HRT)

- Oral administration or injection of synthetic hormones to correct a deficiency in such hormones as estrogen, testosterone, or thyroid hormone.