



# Hypothalamic-Pituitary Axis

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## ANATOMY AND PHYSIOLOGY

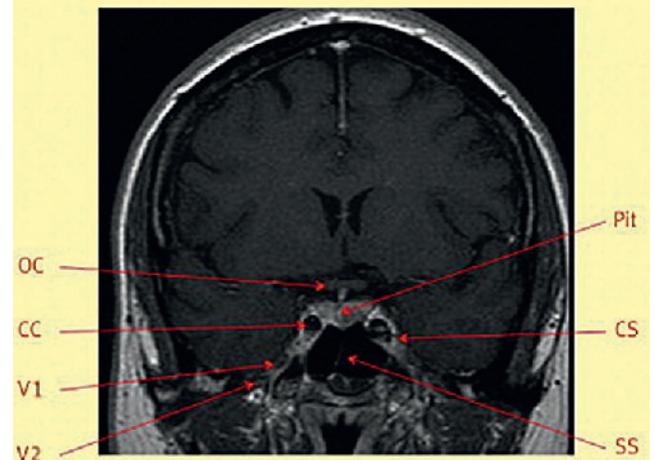
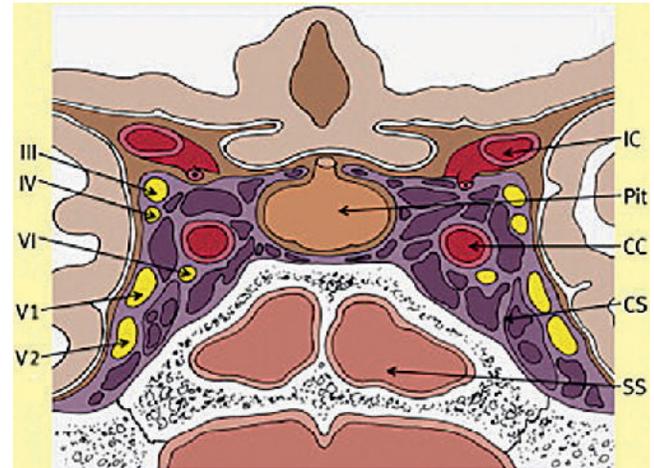
The pituitary gland sits in the skull base in a bony structure called the sella turcica. It weighs approximately 600 mg and is composed of three lobes, the adenohypophysis (anterior lobe), the neurohypophysis (posterior lobe), and the intermediate lobe. The infundibular stalk, which contains the portal plexus circulation, connects the hypothalamus to the pituitary gland. The pituitary gland is surrounded by important structures that can be compromised by its enlargement, including the optic chiasm, located superior to the gland, and the cavernous sinuses, located on both sides of the gland. The cavernous sinuses each contain the internal carotid artery and cranial nerves III, IV, V1, V2, and VI. (Fig. 62-1).

The anterior pituitary gland produces six hormones that are produced by specific cell types within the gland: adrenocorticotropic hormone (ACTH), follicle-stimulating hormone (FSH), luteinizing hormone (LH), growth hormone (GH), prolactin, and thyroid-stimulating hormone (TSH or thyrotropin). These hormones are regulated by stimulatory and inhibitory peptides produced within the ventral hypothalamus and are transported to the anterior pituitary gland by the infundibular portal system. The posterior pituitary gland makes up about 20% of the total pituitary mass and stores and secretes two major peptide hormones: vasopressin (AVP or antidiuretic hormone) and oxytocin. These neurohypophyseal hormones are synthesized by the supraoptic and paraventricular nuclei of the hypothalamus and transported to the posterior lobe in neurosecretory granules along the supraopticohypophyseal tract. (Table 62-1) The intermediate lobe regresses in humans at about 15 weeks gestation and is absent in the adult normal pituitary gland.

On imaging studies, the normal adult pituitary gland has a flat superior border and a vertical height of approximately 8 to 10 mm. The anterior pituitary is homogeneous in signal on magnetic resonance imaging (MRI), the preferred imaging method, and enhances homogeneously after intravenous administration of a contrast agent (see Fig. 62-1). During periods of increased hormonal activity, most notably during pregnancy, the pituitary gland can increase in size and change shape. The posterior pituitary lobe is distinguished from the anterior lobe on T1-weighted MRI as a bright spot in the posterior aspect of the gland, best seen on a sagittal view. The bright appearance is thought to result from the presence of AVP and/or phospholipid vesicles within the normal neurohypophysial.

## PITUITARY TUMORS

Pituitary tumors account for approximately 10% to 15% of intracranial tumors. They are the most common tumors in



**FIGURE 62-1** Coronal section and corresponding magnetic resonance imaging scan of the pituitary gland and surrounding structures, including cranial nerves III (oculomotor), IV (trochlear), V1 (trigeminal, ophthalmic branch), V2 (trigeminal, maxillary branch), and VI (abducens). CC, Carotid artery (intracavernous); CS, cavernous sinus (left); IC, internal carotid artery; OC, optic chiasm; Pit, pituitary gland; SS, sphenoid sinus. (From Jesurasa A, Kailaya-Vasan A, Sinha S: Surgery for pituitary tumors, *Surgery* 29:428–433, 2011, Figure 1.)

the sella, accounting for more than 90% of masses that develop in that area, and they are usually benign. Their true incidence is difficult to determine because they are often asymptomatic, but the prevalence is about 10% to 20% in radiologic studies. Most pituitary tumors are slow growing, but some have higher growth rates and can be invasive. Pituitary carcinomas are very rare and are defined by the presence of a metastasis that is noncontiguous with the original tumor or cerebrospinal fluid dissemination.