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Computed Tomographic Demonstration of the Posterior Pituitary

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From a series of 700 thin, axial, contrast-enhanced CT scans of the sellar region, the posterior lobe of the pituitary was studied. Empty sellae and pituitary lesions larger than 8 mm in diameter were excluded from the study. Of the 320 remaining axial contrast-enhanced CT scans, the posterior lobe of the pituitary was apparent in 124 (39%) as an oval lucency 3–4 mm thick, located medially or paramedially just in front of the dorsum sellae. Normally, the anterior limit of the posterior lobe is always regularly convex forward, but in the presence of a microadenoma of the anterior lobe it may be compressed. The lesser enhancement of the posterior lobe probably correlates with the different volumes of the interstitial spaces in the anterior and in the posterior lobes. The normal picture of the posterior lobe of the pituitary must not be confused with a posteriorly located microadenoma.

The development, histology, blood supply, and function of the posterior lobe of the pituitary gland are very different from those of the anterior lobe. While the anterior lobe is derived from the ectoderm of the stomodeum, the neurohypophysis is derived from the neural ectoderm of the floor of the forebrain. The neurohypophysis is composed of the posterior lobe, the neural part of the stalk, and the expanded upper end of the stalk, which is the median eminence [1]. The object of this report is to describe our computed tomographic (CT) observations of the posterior lobe of the hypophysis.

Materials and Methods

We reviewed 1600 thin coronal and/or axial CT examinations of the pituitary gland, including 700 thin axial CT examinations. In our department, CT of the pituitary gland is performed with a GE CT/8 8800 or 9800 scanner, mainly using 1.5 mm, thin, coronal sections; for the past 2 years CT has been performed in the dynamic mode after intravenous injection of 60 ml of a 32% iodinated contrast medium [2, 3]. Axial sections are only obtained in special conditions. If they are needed, a perfusion of 100 ml of contrast material is given intravenously after the bolus injection to maintain the plasma iodine level during the procedure. The head of the patient is positioned so that the petrous bones are not included in the sections (–10° to –20° to the orbitomeatal line). The gantry is generally not angulated. All images were targeted. Of the 700 cases, 320 constitute the material of this study of posterior pituitary gland.

Results

From a series of 700 thin, axial, contrast-enhanced CT studies of the pituitary gland, we eliminated all patients whose scans showed an empty sella or a pituitary adenoma more than 8 mm in diameter; as a result, 320 patients were analyzed in this study of the posterior lobe of the pituitary. The posterior lobe was clearly identified as a well defined oval lucency in 124 patients (39%). This area of low attenuation is located in the posterior part of the sella, just in front of the dorsum.

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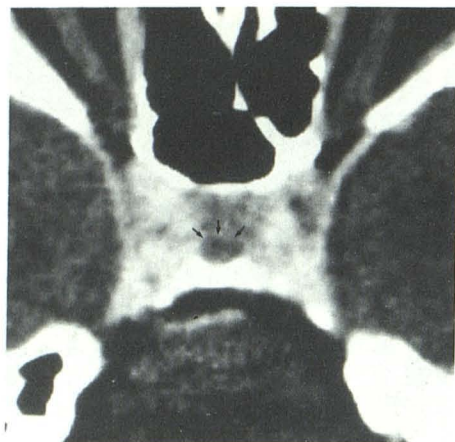
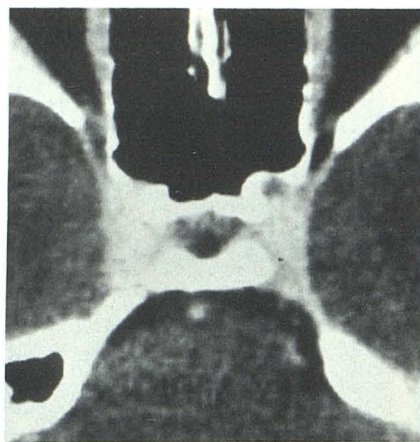
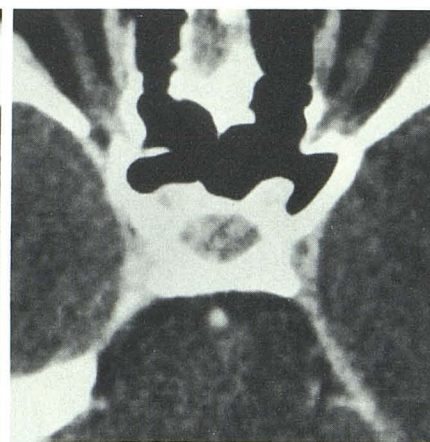


Fig. 1.—Contrast-enhanced 1.5-mm-thick axial CT scan through pituitary. Posterior lobe is oval lucency at posterior part of sella (arrows).



A

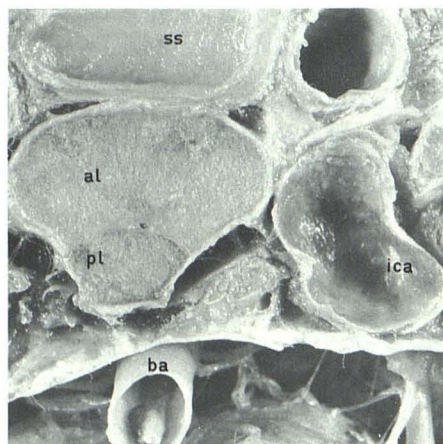


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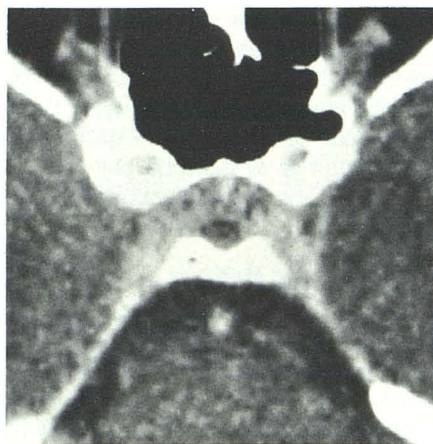


C

Fig. 2.—A and B, 1.5-mm-thick contiguous axial scans through pituitary. Posterior lobe is apparent only in A and is not visible on upper cut through pituitary (B). C, Sagittal reconstruction of sellar region. Posterior lobe appears as low-density area just in front of dorsum (arrow).



A



B

Fig. 3.—A, Anatomic specimen, axial section. Posterior lobe (pl) is invested on each side by dorsal extension of anterior lobe (al). ss = sphenoid sinus; ica = internal carotid artery; ba = basilar artery. B, CT scan of posterior lobe, axial section. Regular convexity of anterior border.

When clearly identified (124 cases), the posterior lobe measured 5–6 mm by 3–4 mm (fig. 1) in all cases. In 26% of the selected procedures, the posterior lobe of the pituitary was poorly seen so that its size could not be measured accurately. In 34% of the procedures the posterior lobe was not identified at all. When demonstrated the posterior pituitary was generally apparent on only one or two 1.5-mm-thick contiguous sections. We were never able to identify the posterior lobe on the uppermost cut through the pituitary (figs. 2A and 2B). This may be explained in part by the fact that the top of the

posterior lobe is covered by some tissue of the pars anterior [1] and by partial-volume averaging of the posterior lobe at the sellar diaphragm level. Sagittally reformatted images (fig. 2C) may also show the posterior lobe well.

The anterior limit of the posterior lobe of the pituitary is always regularly convex forward in normal cases (fig. 3) and is invested by dorsal extension of the anterior lobe on each side. In the presence of a microadenoma of the anterior lobe, the anterior limit of the posterior lobe may or may not be compressed (figs. 4 and 5). The posterior lobe border is often

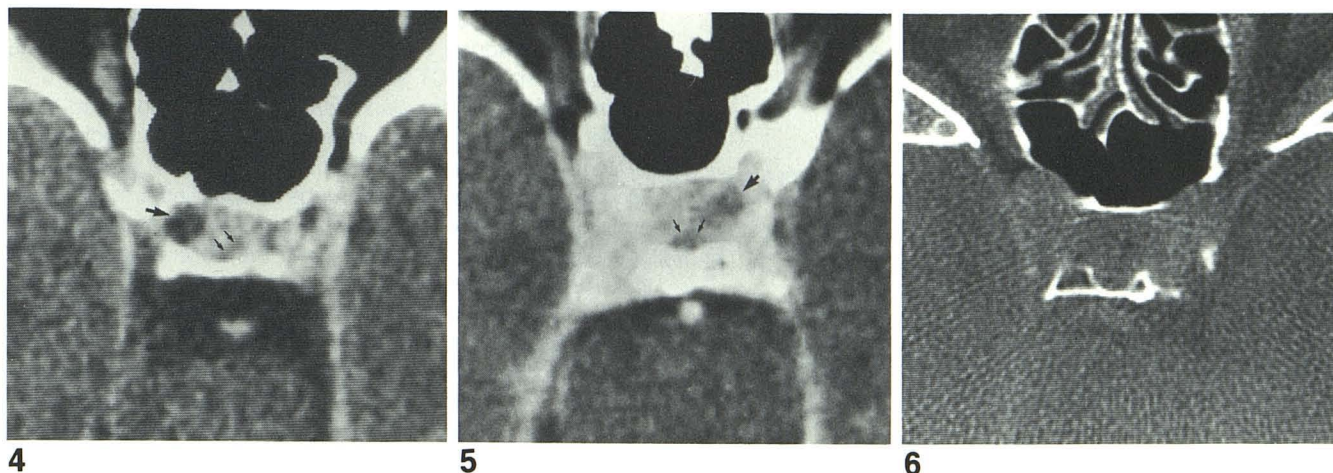


Fig. 4.—Flattening of right side of posterior lobe (*small arrows*) by right intrasellar prolactinoma (*large arrow*).

Fig. 5.—Left intrasellar microadenoma (*large arrow*) without any change of

posterior lobe (*small arrows*).

Fig. 6.—Axial CT section through dorsum sellae (bone window). Imprint of posterior lobe on anterior aspect of dorsum.

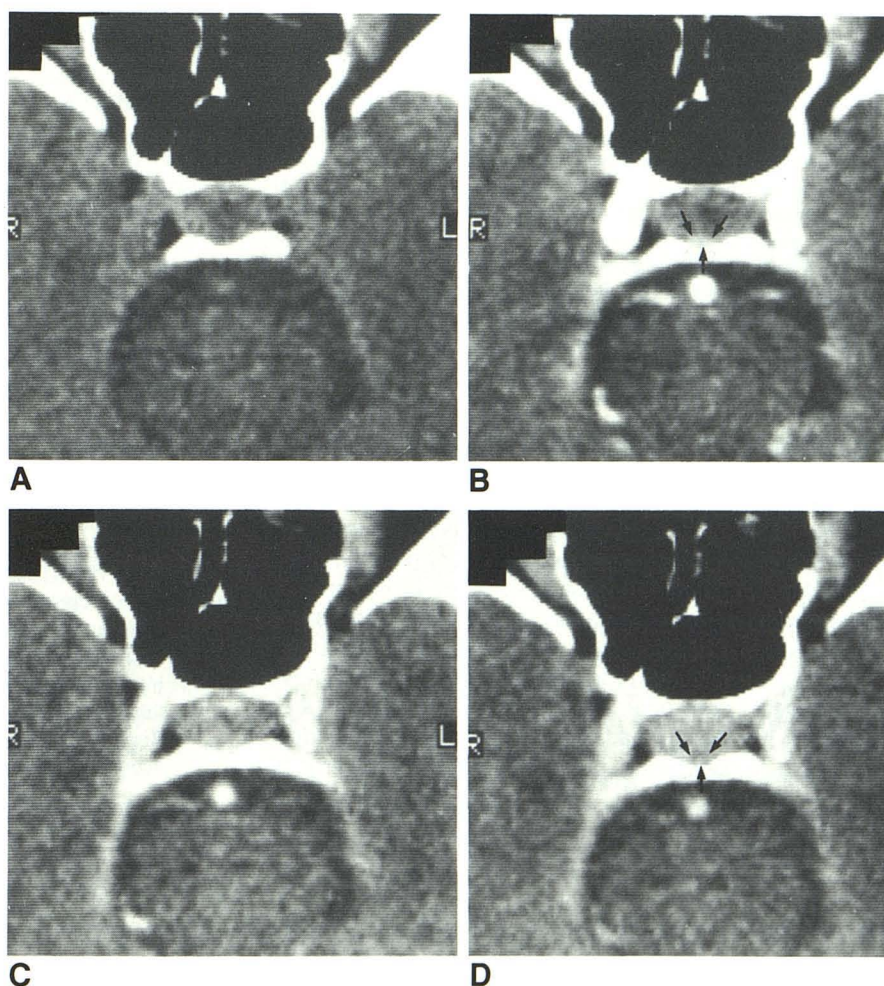


Fig. 7.—Axial dynamic CT scans of pituitary. **A**, Before bolus injection. **B**, 10 sec after bolus injection. Opacification of intracavernous carotid arteries and enhancement of intravascular compartment of posterior lobe (*arrows*). **C**, 20 sec after bolus injection. Enhancement of anterior pituitary. Posterior lobe is not seen clearly. **D**, 50 sec after bolus injection. Maximal enhancement of anterior lobe. Posterior lobe appears as low-density area (*arrows*).

located just in front of a concave imprint of the dorsum (fig. 6). This imprint is midline in only 50% of the cases [4]. In the other cases, the center of the imprint of the dorsum and the

center of the posterior lobe can be situated as far as 3 mm from the midline. The findings using dynamic axial CT (figs. 7 and 8), although not part of our 320 cases, are included to

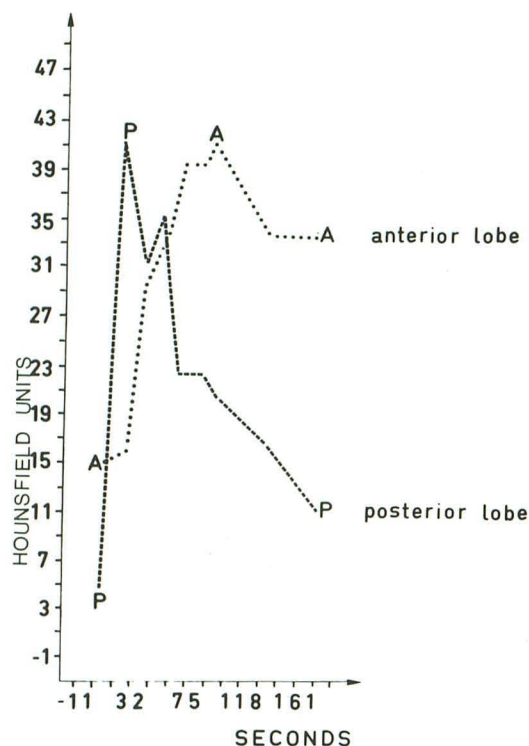


Fig. 8.—Time-density curves for anterior lobe and posterior lobe of pituitary gland. Y axis is labeled in Hounsfield units.

explain the appearance of the posterior part of the pituitary. Figures 7 and 8 are from a series of 20 dynamic axial CT scans obtained in normal patients.

Discussion

Our investigation indicates that in nearly 40% of cases the posterior pituitary will appear on thin, axial, contrast-enhanced CT scans as a low-density area in the posterior part of the sella (figs. 1–4). This area of low attenuation must not be confused with a posteriorly located pituitary microadenoma. In addition, we have noted that the position of the posterior pituitary corresponds in location to the indentation on the dorsum (fig. 6). We have found that the posterior lobe is best demonstrated when it is prominent in size and when there is a wide superior bony aperture of the sella. Low-density areas reported in the literature as probable incidental microadenomas [5] are, in our opinion, more likely to represent large but

normal neurohypophyses. A normal posterior lobe should therefore be added to the list of regions of low density on contrast-enhanced CT scans of the pituitary gland.

The whole pituitary gland resides outside the blood-brain barrier [6]. After a bolus injection of contrast medium, as shown by axial dynamic CT (figs. 7 and 8), the intravascular compartment of the posterior lobe is opacified first, because of its direct arterial blood supply through the meningo-hypophyseal trunk [7]. This agrees with the observations of Wislocki [8]. But, at some time after the injection, when the contrast medium equilibrates between the intravascular and extravascular interstitial spaces, less enhancement of the posterior lobe is present (figs. 7 and 8), which may correlate with the lesser volume of the interstitial spaces of the posterior lobe [9]. We believe that these data explain our observations that the posterior lobe of the pituitary gland appears less enhanced than the anterior lobe after routine injection of contrast material.

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