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# CT of the Abnormal Pituitary Stalk

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Seven cases are presented in which enlargement of the pituitary stalk was demonstrated by computed tomography (CT). Histiocytosis X, sarcoidosis, and metastatic cancer were the proven or presumed causes. The discovery of pituitary stalk enlargement prompted radiation treatment in three patients and led to the diagnosis of previously unsuspected diabetes insipidus in one.

High-resolution computed tomography (CT) permits visualization of the pituitary stalk, especially when thin sections (5 mm or smaller) are used [1, 2]. This structure normally is no more than 4 mm in diameter [1-3]. Although many pathologic conditions are known to involve the pituitary stalk, either from clinical manifestations or autopsy studies, there are few reports of CT visualization of such lesions [4, 5]. We present cases illustrating several causes of enlargement of the pituitary stalk, as demonstrated by CT, and emphasize that this finding, either in isolation or associated with other abnormalities on the CT scan, may significantly affect patient management.

## Materials and Methods

The cases were selected from more than 9000 cranial CT scans obtained at our institution since the installation of the GE/8800 scanner in April 1980. All scans were obtained after rapid drip infusion of 150 ml of Conray 60 (Mallinckrodt). Axial sections were 5 or 10 mm thick and parallel to the orbitomeatal line. Coronal sections were 5 or 1.5 mm thick and as close to perpendicular to the orbitomeatal line as possible, given limitations imposed by patient mobility and metallic dental work.

## Case Reports

### Case 1

A 20-year-old woman had diabetes insipidus, hypothyroidism, and amenorrhea-galactorrhea. Several years earlier, she had been studied for bilateral tibial lytic lesions, proven by biopsy to be caused by histiocytosis X. Cranial CT showed a 13 mm enhancing mass at the expected site of the pituitary stalk (figs. 1A and 1B). After radiation therapy (1200 rad [12 Gy] to the hypothalamic-pituitary region in six fractions over 2 weeks), thyroid function and menses returned to normal. CT 1 year later (fig. 1C) showed the suprasellar mass was markedly reduced. The diabetes insipidus did not remit.

### Case 2

A 35-year-old woman had a lump in the neck, amenorrhea-galactorrhea, and markedly elevated serum prolactin. The chest radiograph revealed an anterior mediastinal mass. Cranial CT showed a 5 mm pituitary stalk (fig. 2). Biopsy of the neck mass was consistent with sarcoidosis. The patient was lost to follow-up.

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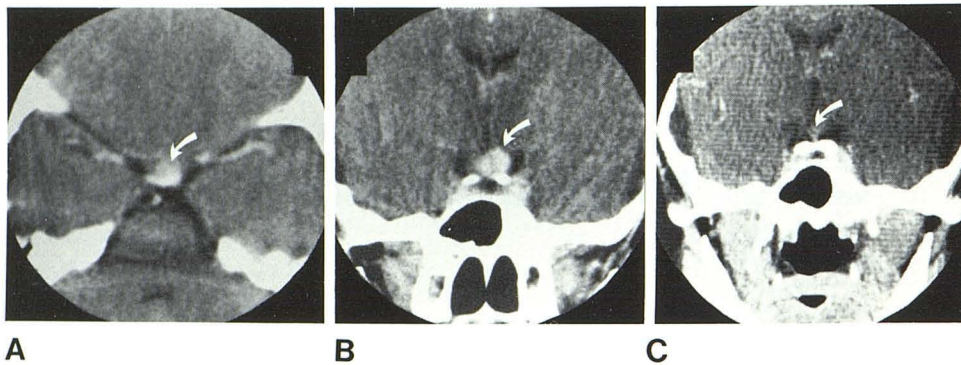


Fig. 1.—Case 1. Histiocytosis X of pituitary stalk. **A**, Contrast-enhanced axial CT. Enhancing mass (*arrow*), eccentric to left, in posterior suprasellar cistern. **B**, Coronal section. Mass (*arrow*) at expected site of pituitary stalk extends slightly into left hypothalamus. **C**, Follow-up CT 1 year after radiation therapy. Mass (*arrow*) is markedly smaller and pituitary stalk can be identified.

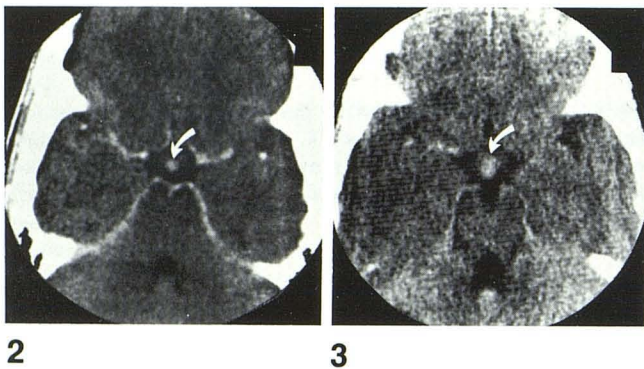


Fig. 2.—Case 2. Sarcoidosis (presumed). Axial CT scan. Upper aspect of pituitary stalk (*arrow*) is enlarged and irregular in outline.

Fig. 3.—Case 3. Sarcoidosis (presumed). Axial CT scan. Mildly enhancing, somewhat irregular mass (*arrow*) occupies region of upper pituitary stalk and optic chiasm.

#### Case 3

A 35-year-old woman had visual loss and diabetes insipidus. There was a history of pulmonary sarcoidosis and sarcoid meningitis, which responded to steroids. CT showed irregular enlargement (8 mm) of the pituitary stalk (fig. 3). The diabetes insipidus responded to vasopressin therapy. The patient was lost to follow-up.

#### Case 4

A 45-year-old woman had diabetes insipidus. A CT scan of the brain revealed enlargement of the pituitary stalk (5.5 mm) and an enhancing lesion in the left caudate nucleus (figs. 4A and 4B). A diagnosis of lymphoma or metastatic disease was suggested on the basis of the CT findings. Radiation (2500 rad [25 Gy]) was delivered empirically, resulting in dramatic shrinkage of the caudate lesion and return of the pituitary stalk to normal size (2.5 mm) (figs. 4C and 4D). A search for the primary tumor was not rewarded. About 1 year after presentation, undifferentiated adenocarcinoma was discovered on cerebrospinal fluid examination.

#### Case 5

A 55-year-old man with known carcinoma of the lung had a palpable mass beneath the scalp. Cranial CT revealed metastatic disease of the left frontal bone with epidural and subgaleal extension and a very large (10 mm) pituitary stalk (fig. 5). Further investigation yielded no

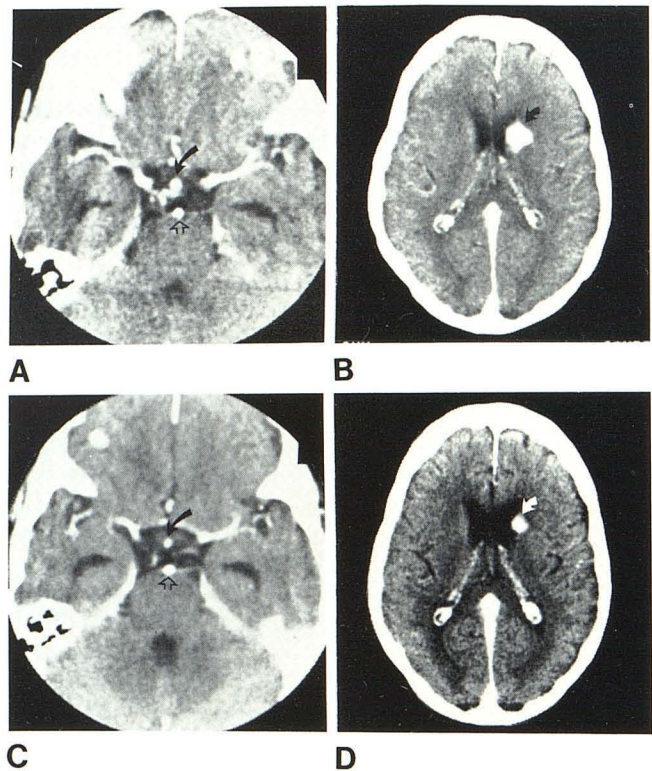


Fig. 4.—Case 4. Metastatic carcinoma (primary unknown). Axial CT scans. **A**, Pituitary stalk (*solid arrow*) is enlarged in comparison with smaller basilar artery (*open arrow*). **B**, Enhancing lesion (*arrow*) in left caudate nucleus. **C** and **D**, After radiation therapy. Stalk (*solid black arrow*) is normal in size, and is now smaller than basilar artery (*open arrow*); caudate lesion (*white arrow*) is much smaller.

evidence of diabetes insipidus or other endocrine abnormality. Visual field examination also was normal.

#### Case 6

A 52-year-old woman with a prior mastectomy for breast carcinoma had an episode of confusion. Cranial CT showed multiple small metastatic lesions in the left hemisphere and cerebellum. The pituitary stalk was enlarged (6.5 mm diam) (fig. 6A). Because of this CT finding, the patient was questioned and admitted to having increased fluid intake and urination for 3 weeks before presentation. Endocrinologic evaluation revealed partial diabetes insipidus, which re-

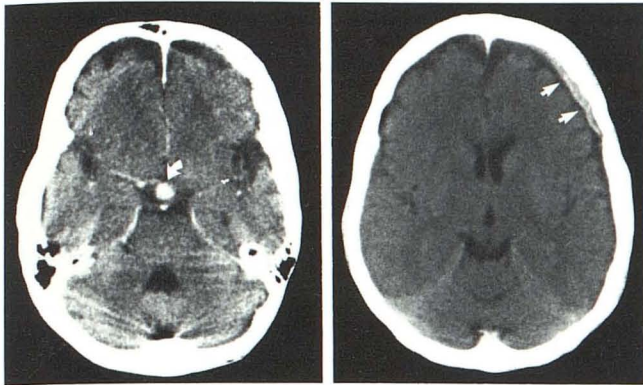


Fig. 5.—Case 5. Metastatic carcinoma (lung primary). Axial CT scans. **A**, Enhancing mass (*arrow*) at expected site of pituitary stalk. **B**, Higher section reveals epidural and subgaleal tumor (*arrows*).

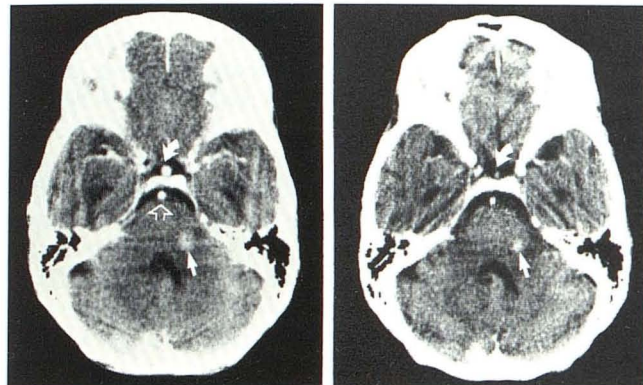


Fig. 6.—Case 6. Metastatic carcinoma (breast primary). Axial CT scans. **A**, Pituitary stalk (*curved arrow*) is enlarged, especially in comparison with basilar artery (*open arrow*). Second lesion (*solid, straight arrow*) in left brachium pontis. **B**, Repeat scan 3 months after radiation therapy. Stalk (*curved arrow*) is normal in size, and is now smaller than basilar artery; cerebellar lesion (*straight arrow*) also is somewhat smaller.

sponded to drug therapy. Repeat CT after radiation therapy (3000 rad [30 Gy] to the whole brain in 10 fractions over 2 weeks) showed all of the lesions had either shrunk or disappeared, and the pituitary stalk was normal in size (fig. 6B).

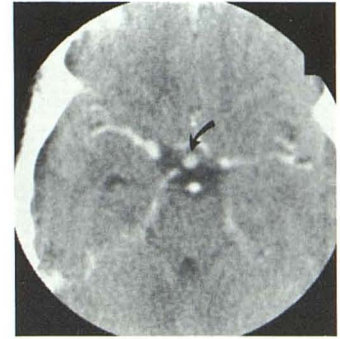
#### Case 7

A 21-year-old woman was evaluated for short stature, delayed sexual maturation, and evidence of panhypopituitarism. Cranial CT showed a 7 mm enhancing lesion at the expected site of the pituitary stalk (fig. 7). A small neoplasm, such as a craniopharyngioma, was suspected, but no further diagnostic evaluation was undertaken. Follow-up CT scans have shown no change over 2 years.

#### Discussion

The pituitary stalk or infundibulum extends from the tuber cinereum, on the undersurface of the hypothalamus, to the

Fig. 7.—Case 7. Unidentified disease process (suspected neoplasm). Contrast-enhanced axial CT. Pituitary stalk (*arrow*) is enlarged in comparison with smaller basilar artery.



posterior pituitary gland. It is seen on contrast-enhanced axial CT scans as a small, rounded, enhancing structure in the mid or midposterior region of the suprasellar cistern, posterior to the optic chiasm and anterior to the upper aspect of the dorsum sellae. It is seldom visible on unenhanced scans. Differentiation between the stalk proper and the tuber cinereum is difficult or impossible on axial CT. For this reason, the entities discussed will be referred to as pituitary stalk lesions.

A great variety of infectious and granulomatous processes may involve the pituitary stalk [6, 7]. Although primary neoplasms are rare [8, 9], metastatic deposits are not unusual and appear to be especially common in breast cancer [10, 11].

Large masses in the suprasellar cistern are readily recognizable. However, since the normal pituitary stalk shows contrast enhancement [12], a small mass usually appears only as enlargement of the stalk, a finding that is easily overlooked.

The basilar artery often is seen on the same axial CT section as the pituitary stalk and is almost always larger. Reversal of the size relation of these two structures is a reliable sign of enlargement of the stalk [1], as seen in cases 4, 6, and 7.

Since involvement of the pituitary-hypothalamic axis is a classic finding in histiocytosis [7], and the diagnosis in case 1 had been established by other means, the CT findings were not unexpected. However, the presence of a definable abnormality on the CT scan prompted a specific and effective therapy (i.e., radiation), which would not otherwise have been undertaken at our institution.

While it is well known that sarcoidosis may involve the central nervous system, particularly the hypothalamic-pituitary region [7], this occurs in less than 1% of cases [13]. Thus, the possibility of a coexisting pathologic entity, such as a pituitary adenoma, should not be dismissed when endocrine abnormalities are found in sarcoidosis [13]. Cranial CT scans in cases 2 and 3 reliably excluded pituitary adenoma, while demonstrating suprasellar lesions consistent with sarcoidosis [14].

Metastatic disease is probably the most common cause of acquired nontraumatic diabetes insipidus in the middle-aged and elderly population [15]. CT demonstration of metastatic disease to the pituitary stalk has not, to our knowledge, been previously reported, although such metastases are not uncommon [10, 11]. These lesions may be asymptomatic, even

when relatively large (case 5). Conversely, very small lesions may have clinical significance. In case 4, recognition of the pituitary stalk lesion, besides explaining the patient's presenting complaint of diabetes insipidus, was crucial in making the diagnosis of multicentric disease, and possibly obviated a craniotomy to diagnose the more obvious lesion in the caudate nucleus. The slight stalk enlargement seen in case 6 could easily have been overlooked, but recognition of it prompted a reevaluation that led to the discovery of unsuspected diabetes insipidus and the institution of specific and effective therapy.

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