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MR of the Diaphragma Sellae

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The appearance of the diaphragma sellae is described in cryomicrotomic sections and on MR in patients with and without intra- and suprasellar masses. On MR, it appears as a thin band of negligible signal that is best shown when adjacent CSF or a mass has greater signal intensity. Its position or absence can be used to differentiate intrasellar masses with suprasellar components from suprasellar masses.

Differentiating intrasellar masses with suprasellar components from suprasellar masses may be difficult with CT because the pituitary gland, diaphragma sellae, and suprasellar masses may enhance equally after intravenous contrast administration. Theoretically, MR should be able to show the diaphragma sellae because other dural reflections, such as the falx cerebri and walls of the cavernous sinuses, can be differentiated from the adjacent CSF when it has greater signal intensity [1].

Materials and Methods

Sagittal or coronal anatomic images of the sella were obtained by sectioning four fresh frozen cadaver heads with a horizontally cutting heavy-duty sledge cryomicrotome (LKB 2250) and then serially photographing the surfaces of the specimens [2]. In the anatomic images, the diaphragma sellae and associated blood vessels, the pituitary gland, and the infundibulum were identified using anatomic literature [3–5].

Ten normal volunteers and 22 patients were studied with MR. The patients included 12 with pituitary microadenomas that were verified by surgical findings (four cases) and by CT, clinical, and chemical findings [6]; seven with pituitary macroadenomas and two with tuberculum sellae meningiomas that were verified by CT and surgery; and one with a large suprasellar aneurysm that was verified by CT and angiography.

The patients and volunteers were studied with 1.3–1.5-T research MR scanners or with a 1.5-T commercial MR scanner (General Electric Signa). The MR technique included a sagittal localizer scan, sagittal and/or coronal scans, 3- or 5-mm thick slices, 128 × 256 or 256 × 256 matrix, one or two signal acquisitions, a short repetition time (TR) of 300–800 msec with a 20–25 msec echo delay (TE), a long TR (2000 or 2500 msec) with 25, 50, 75, and 100 msec TE, and single or multislice data acquisition.

The anatomic and MR images were correlated to identify dural reflections and intra- and suprasellar structures.

Results and Discussion

The diaphragma sellae, a dural membrane that forms the upper margin of the pituitary fossa, extends from the dorsum sellae to the tuberculum sellae and between the medial dural walls of the cavernous sinuses. The diaphragma has a central opening of variable size through which the infundibulum extends from the hypothalamus to the posterior lobe of the pituitary gland. Vascular supply to the diaphragma consists of intercavernous venous connections and branches of the

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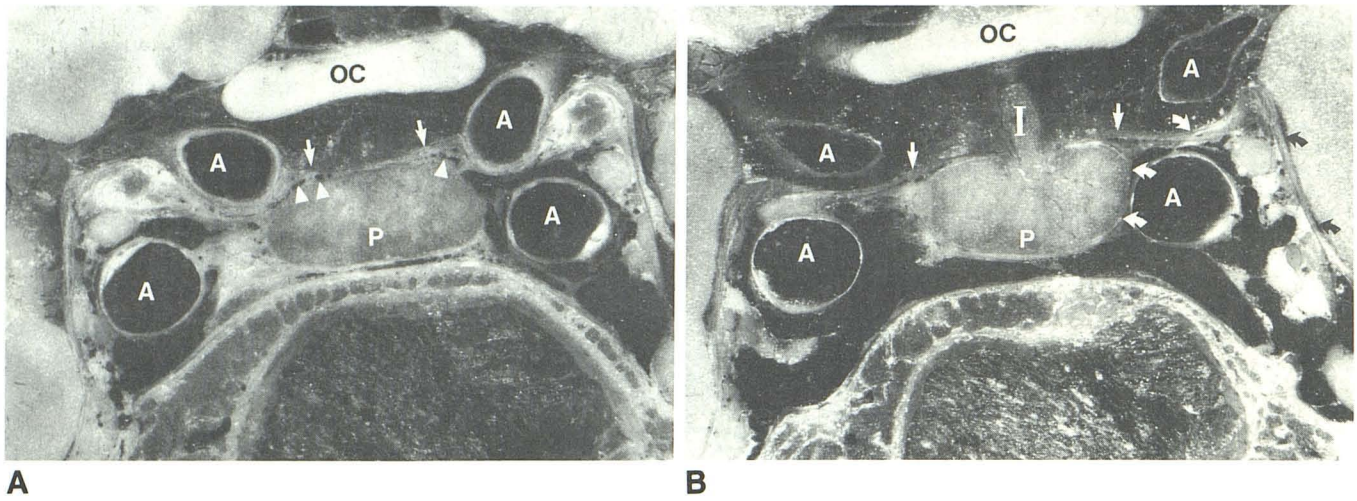
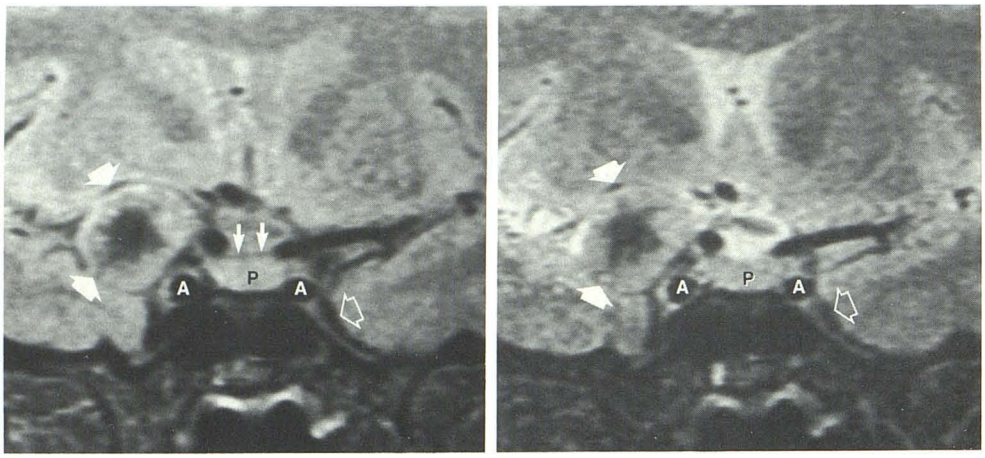


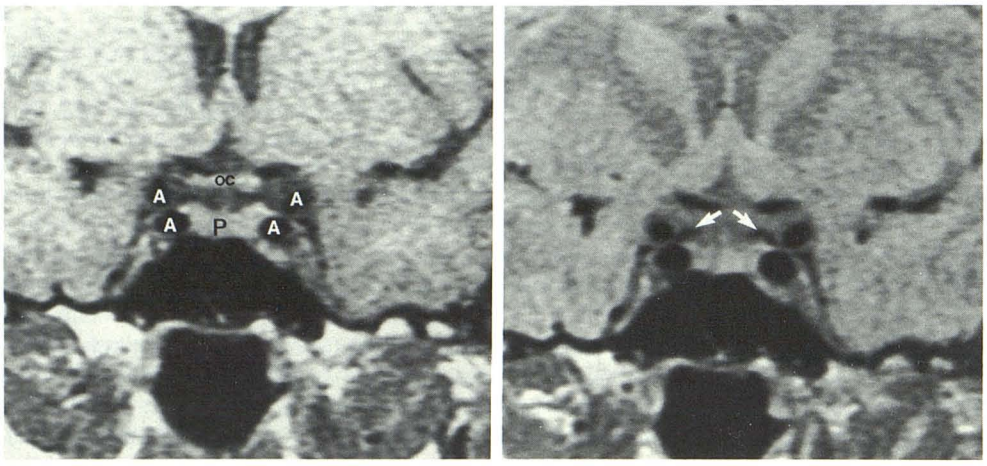
A B

Fig. 1.—**A** and **B**, Coronal cryomicrotomic sections through sella. In the more anterior section (**A**), diaphragma sellae (*arrows*) is straight and intact and has small blood vessels (*arrowheads*) at its undersurface. In **B**, diaphragma sellae (*straight arrows*) is mildly convex lateral to infundibulum (I), which extends through the diaphragma's central opening. Diaphragma is contiguous with dura (*curved arrows*) covering pituitary gland and cavernous sinuses. (A = internal carotid artery, P = pituitary gland, OC = optic chiasm.)



A B

Fig. 2.—Coronal MR images through pituitary gland (P) and a parasellar meningioma (*wide solid arrows*). In a long TR, short TE image (**A**), note diaphragma sellae appearing as a band of negligible signal (*thin arrows*) above pituitary gland. In a long TR and TE image (**B**), band is not shown and CSF has high intensity signal. (*Open arrow* = wall of cavernous sinus, A = internal carotid artery.)



A B

Fig. 3.—Variations of normal appearance of diaphragma sellae may occur. In **A**, a coronal short TR and TE image, the infundibulum extends to pituitary gland (P). (A = internal carotid artery, OC = optic chiasm.) In **B**, a long TR, short TE image at same location as **A**, prominent curvilinear structures (*arrows*) with negligible signal probably represent a combination of diaphragma sellae and prominent blood vessels.

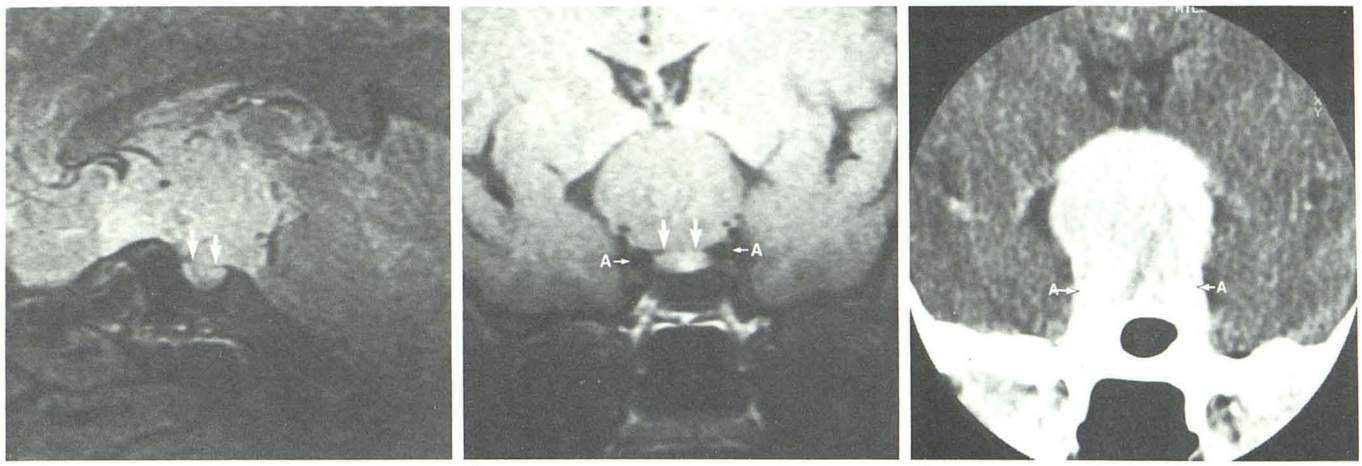


Fig. 4.—Diaphragma sellae (*arrows*) appears intact below a tuberculum sellae meningioma in sagittal long TR and TE (**A**) and coronal short TR (**B**) images. Diaphragma sellae, pituitary gland, cavernous sinus, and tumor enhance equally in an intravenously enhanced coronal CT scan (**C**). At surgery, diaphragma sellae was normal. (A = internal carotid artery.)

Fig. 5.—Diaphragma sellae (*open curved arrow*) is not displaced by suprasellar aneurysm in short TR (**A**) and long TR–short TE (**B**) coronal images. Aneurysm has mixed signal intensity, representing small lumen (*arrow*) and thrombus. Medial temporal lobe encephalomalacia (*asterisk*) represents infarction.

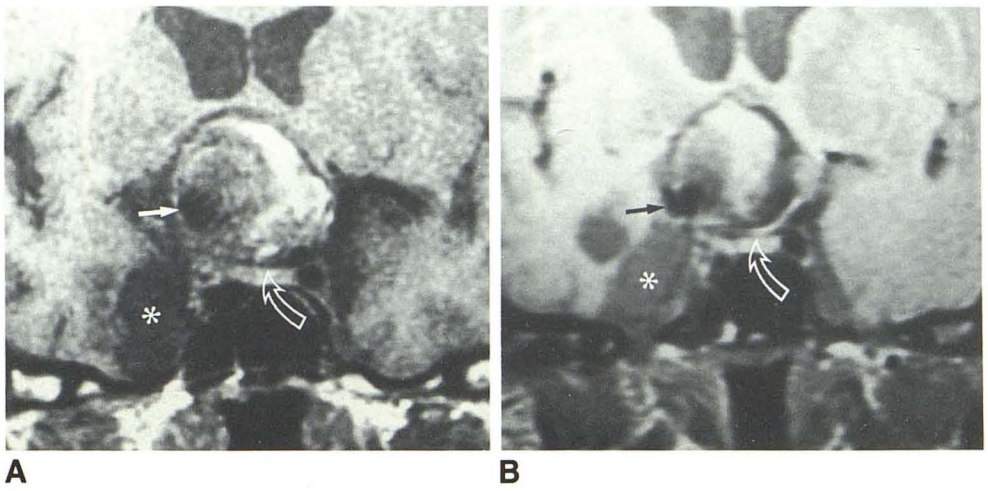
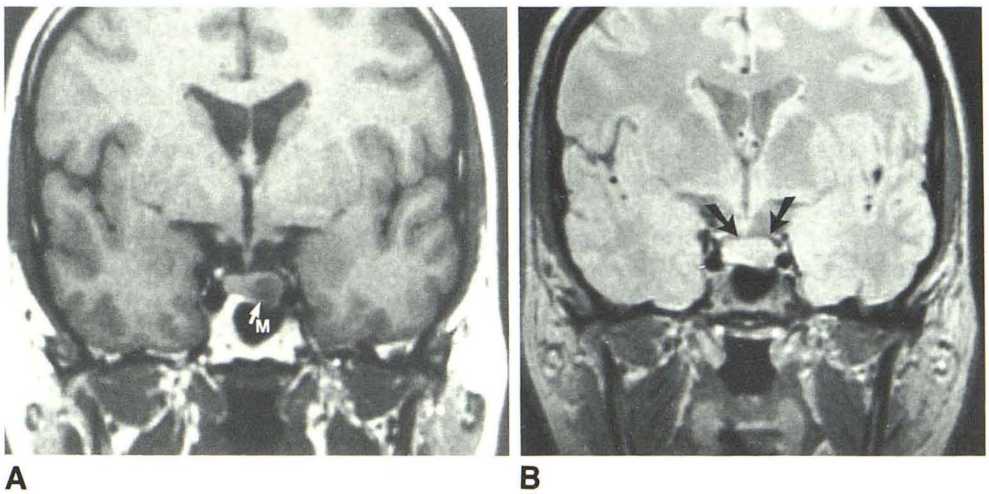


Fig. 6.—Pituitary microadenoma (M) showing less and the same signal intensity as that of pituitary gland in comparing short TR (**A**) and long TR–short TE (**B**) coronal images. Diaphragma sellae (*arrows*) is displaced upward by microadenoma in **B.**



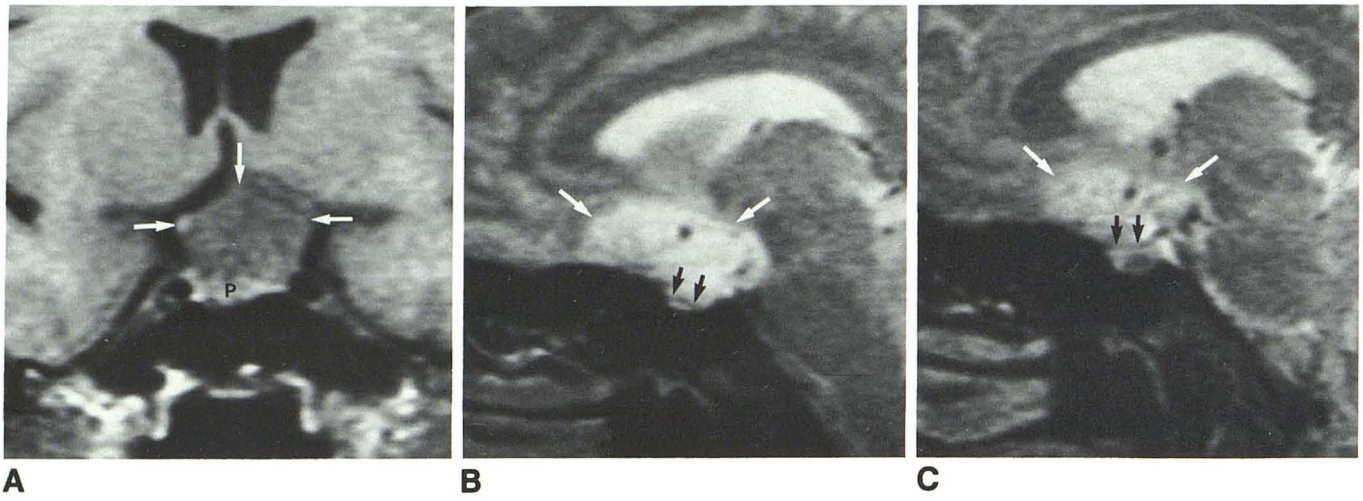


Fig. 7.—**A**, Surgically verified tuberculum sellae meningioma (*white arrows*) extends into left side of pituitary fossa and has a less intense signal than that of pituitary gland (P) in a short TR coronal image. **B**, Diaphragma sellae (*black arrows*) is displaced downward in sagittal long TR and TE image through left side of tumor but not in sagittal image through right side (**C**).

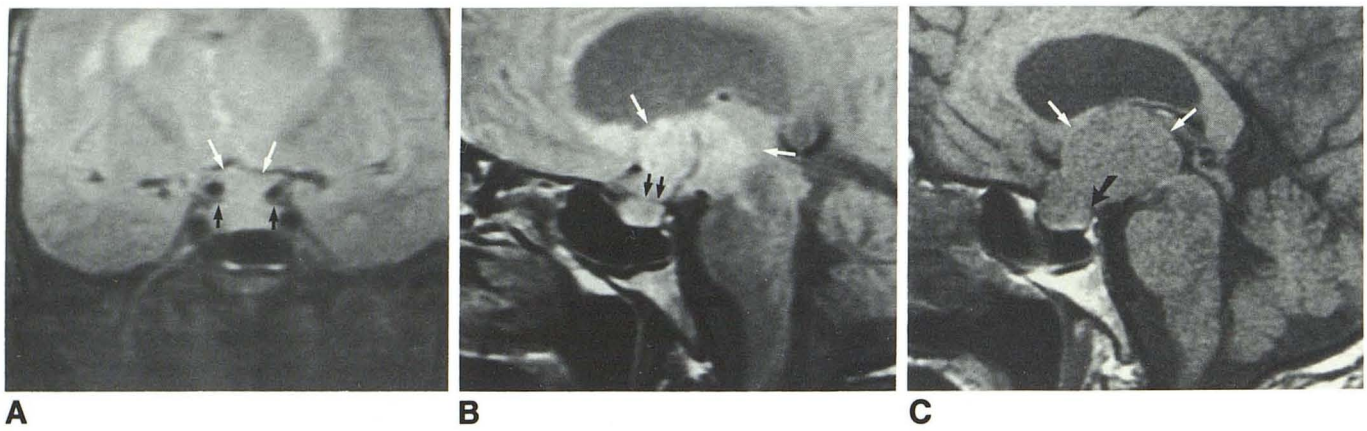


Fig. 8.—Pituitary adenoma with large suprasellar component (*white arrows*). Edges of diaphragma sellae (*black arrows*) are identified in coronal (**A**) and parasagittal (**B**) long TR images and in midline short TR image (**C**).

inferior hypophyseal and intracavernous internal carotid arteries [3–5].

In sagittal and coronal cryomicrotomic sections, the diaphragma sellae appears as a thin transverse dural membrane associated with small blood vessels at its inferolateral surface. In a coronal section through the posterior part of the pituitary gland, the diaphragma appears slightly convex lateral to the infundibulum. In a more anterior coronal section, the diaphragma appears straight (Fig. 1).

In most sagittal and coronal MR images of normal volunteers and patients without a sellar mass, a thin band of negligible signal is identified above the sella turcica that has the configuration of the diaphragma sellae (Fig. 2). Just as other dural reflections produce negligible signals, this band likely represents the diaphragma sellae and adjacent blood vessels. The central hiatus in the band is best shown in a coronal section in which the infundibulum attaches to the pituitary gland. In most cases, the band is better seen in long TR and short TE images than in short TR images or in long TR and TE images, probably because of partial volume averaging of high-intensity CSF in the latter images. Uncommonly, the band appears thickened, probably from prominent blood vessels (Fig. 3).

In MR images of patients with intra- or suprasellar masses, the band can be identified (Figs. 4–8). The band is displaced upward in pituitary microadenomas in 25% of our cases and downward in one of our two cases of tuberculum sellae meningioma. It is not identified centrally in any case of pituitary macroadenoma.

Identification of the diaphragma sellae with MR can be used to help define the upper limit of intrasellar pathology, the lower limit of suprasellar pathology, and to help differentiate tuber-

culum sellae meningioma from pituitary macroadenoma when meningiomatous hyperostosis or calcification may not be as obvious as with CT.

REFERENCES

1. Daniels DL, Pech P, Mark L, Pojunas K, Williams AL, Haughton VM. Magnetic resonance imaging of the cavernous sinus. *AJNR* **1985**;6:187–192
2. Rauschning W, Berstrom K, Pech P. Correlative craniospinal anatomy studies by computed tomography and cryomicrotomy. *J Comput Assist Tomogr* **1983**;7:9–13
3. Bonneville JF, Dietemann JL. *Radiology of the sella turcica.* Berlin: Springer-Verlag, **1981**:12–15
4. Bergland RM, Ray BS, Turack RM. Anatomical variations in the pituitary gland and adjacent structures in 225 human embryo cases. *J Neurosurg* **1968**;28:93–99
5. Renn WH, Rhoton AL. Microsurgical anatomy of the sellar region. *J Neurosurg* **1975**;43:288–298
6. Pojunas KW, Daniels DL, Williams AL, Haughton VM. MR imaging of prolactin-secreting microadenomas. *AJNR* **1986**;7:209–213