

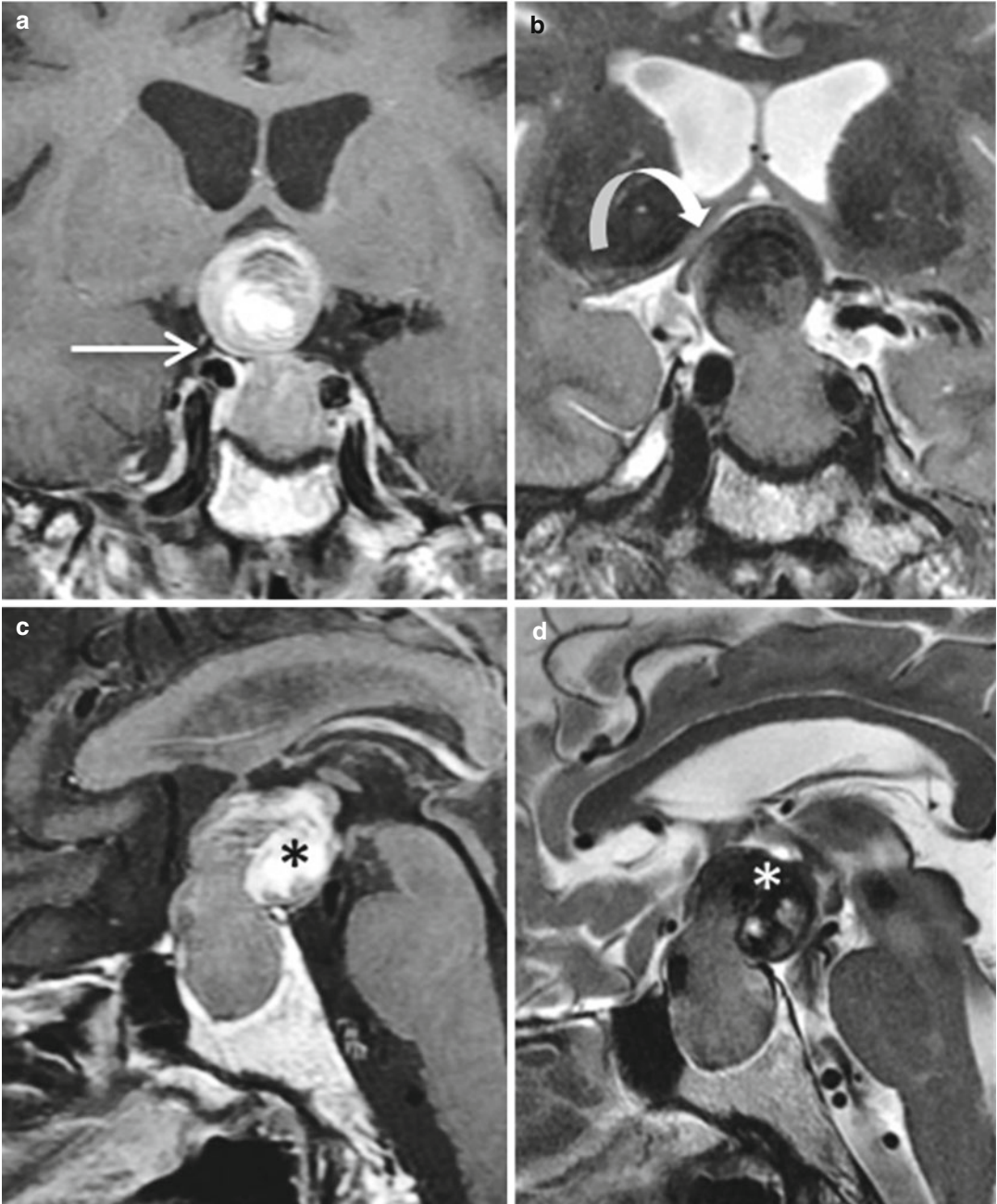
# Nonfunctioning Pituitary Macroadenoma: General Points

# 4

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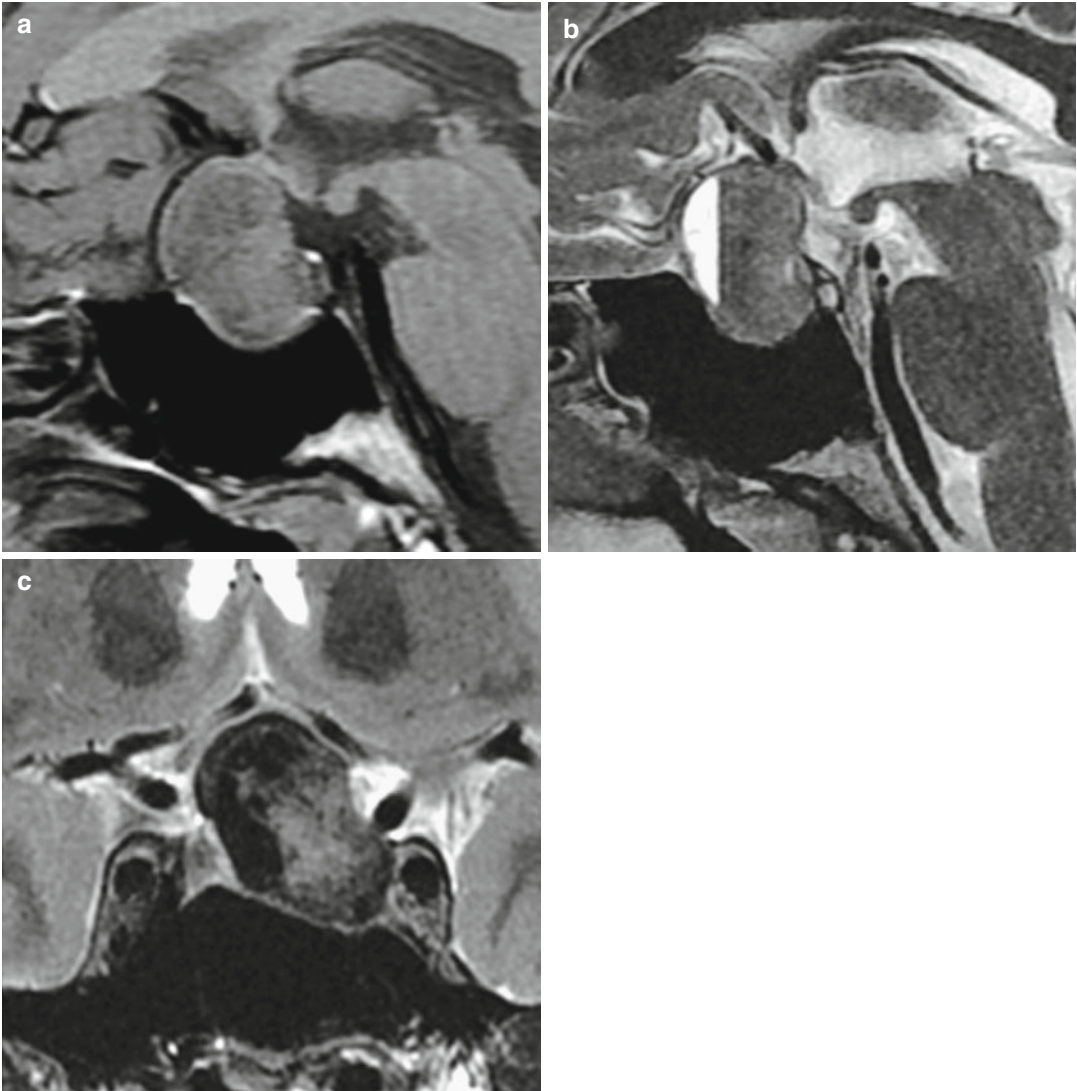
Nonfunctioning pituitary macroadenomas, also named nonsecreting adenomas, are frequently in fact gonadotropic adenomas, more rarely null-cell adenomas. They are responsible for neurologic symptoms (mainly visual field defect, headache) or endocrinologic symptoms (mainly anterior pituitary insufficiency). They are also very frequently discovered by chance and can be totally asymptomatic. In the latter case, a conservative approach can be proposed, particularly in the elderly, with a long-term MRI follow up. In young patients, finding a large, invasive pituitary adenoma—secreting or not—should prompt research of AIP and MEN1 gene mutations. Family history of pituitary adenomas or other features of the MEN1 syndrome in the patient and family should also be used to orient genetic research. In every case, a strict imaging protocol must be applied after surgery, the risk of recurrence being around 30 %. Pituitary nonfunctioning macroadenomas are usually centered by an enlarged sella turcica. Signal intensity is usually inhomogeneous, particularly on T2W images with disseminated areas of hyperintensities reflecting cystic or necrotic components. T1 hyperintensity indicates the presence of blood, as does fluid-fluid level (Figs. 4.1 and 4.2). Old hemorrhage may be detected on T2\*WI only (Fig. 4.3). Gadolinium injection offers a more clear-cut demonstration of tumoral contours; it enhances the normal pituitary tissue, which is distorted and displaced laterally on one side, and superiorly, but quite never inferiorly (Fig. 4.4). Demonstration of the normal residual pituitary

gland is of crucial importance for the neurosurgeon. Enhancement of the dura, the so-called dural tail (Figs. 4.4 and 4.5), previously described as specific of meningiomas, has been described with large pituitary adenomas, especially if hemorrhagic or soon after surgery, and with perisellar aneurysms and other sellar tumors. The degree of enhancement of the solid part of the pituitary adenoma does not reflect the vascular density of the tumor and is thus not predictable of a potential perioperative hemorrhage. Conversely, flow-void linear images on T1WI or T2WI indicate the presence of intratumoral arteries (Fig. 4.6). Nonfunctioning macroadenomas present usually with an extrasellar extension, upward into the suprasellar cistern, downward into the sphenoid sinus, or laterally into the cavernous sinus. Upward extension is present in more than 70 % of cases. The suprasellar component of the largest macroadenomas is often multilobular (Fig. 4.7). The sellar diaphragm can operate as a belt, giving the adenoma an hourglass shape. If the suprasellar extension is moderate, the T1-hyperintense posterior lobe is compressed and flattened, and best identified in axial T1 fat-saturated noncontrast WI. Aberrant storage of antidiuretic hormone, the so-called ectopic posterior lobe, occurs when the pituitary stalk is severely compressed, i.e., in practice with macroadenomas more than 20 mm in height (see Chap. 53). Various degrees of distortion or thinning of the optic chiasm can be observed. Its hyperintensity on T2WIs could indicate a poor visual prognosis, but the lesion can be



**Fig. 4.1** Nonfunctioning pituitary adenoma with suprasellar extension and hemorrhagic component. (a, b) Coronal CE T1 and T2 WIs. (c, d) Sagittal T1 and T2 WIs. The sellar diaphragm (*straight arrow*) separates as a waist the intra- and suprasellar tumoral compartments. The

most superior and posterior part of the adenoma is hyperintense on T1WI and hypointense on T2WI, thus signaling a hemorrhagic event (*asterisk*). Note the extreme thinness of the displaced optic chiasm (*curved arrow*)



**Fig. 4.2** Hemorrhagic macroadenoma with fluid-fluid level. (a) Sagittal T1WI. (b, c) Sagittal and coronal T2WIs. Heterogeneous signal in (a). In (b), fluid-fluid

level shows old hemorrhage. (c) Coronal T2WI: predominant T2-hypointense signal

reversible if the responsible pituitary adenoma is quickly removed (Fig. 4.8). Ptosis of a V-shaped appearing optic chiasm within a secondary empty sella frequently occurs after surgery.

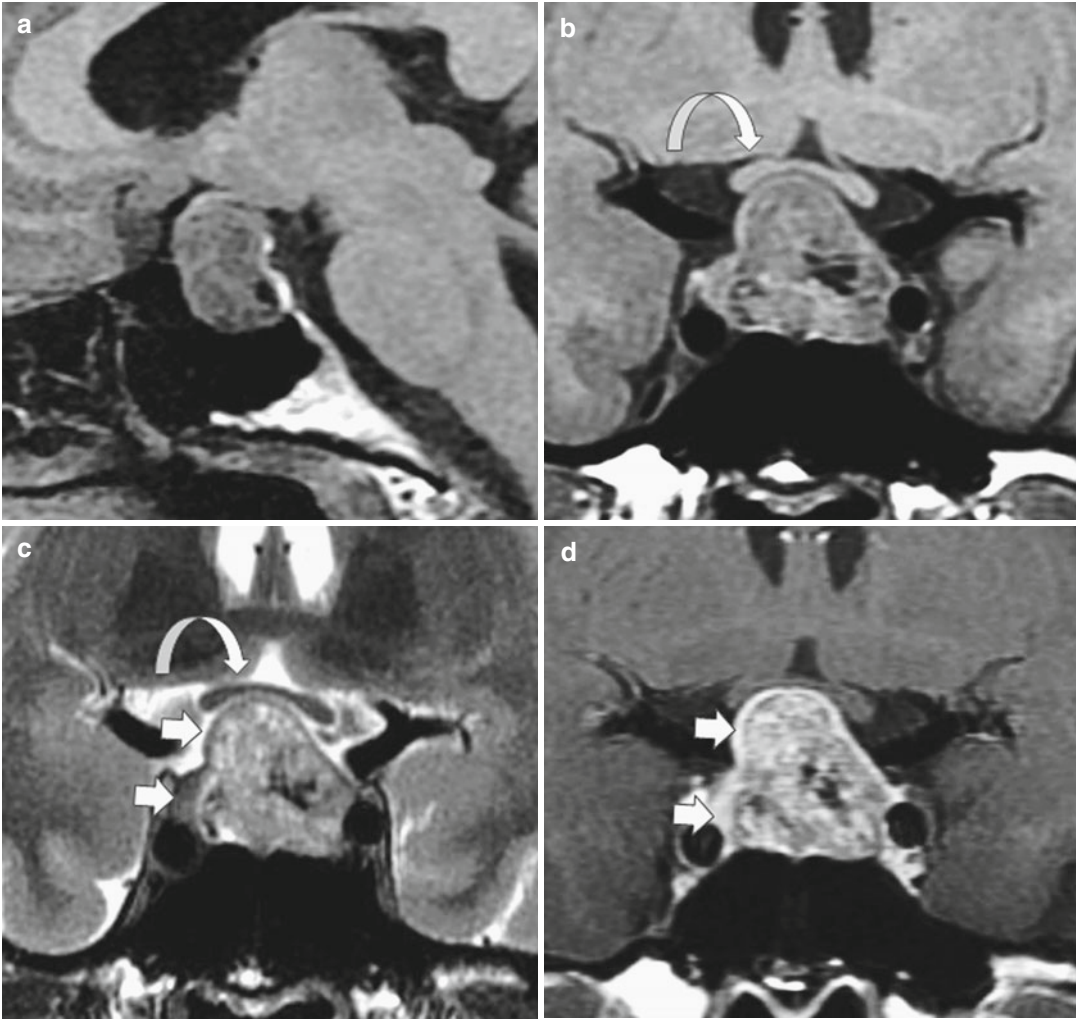
Downward extension of nonfunctioning pituitary adenomas is less frequent than in GH-secreting adenomas or prolactinomas. Special attention has to be paid to clival invasion, present in 8 % of macroadenomas, preferentially in females and with large-volume null-cell ade-

nomas (Fig. 10.4). MRI or, better, CT demonstrate a focal or widespread defect of the more anterior cephalad portion of the clivus and decreased attenuation in underlying trabecular bone. Severe surgical complications can occur, especially if clival invasion is not recognized preoperatively.

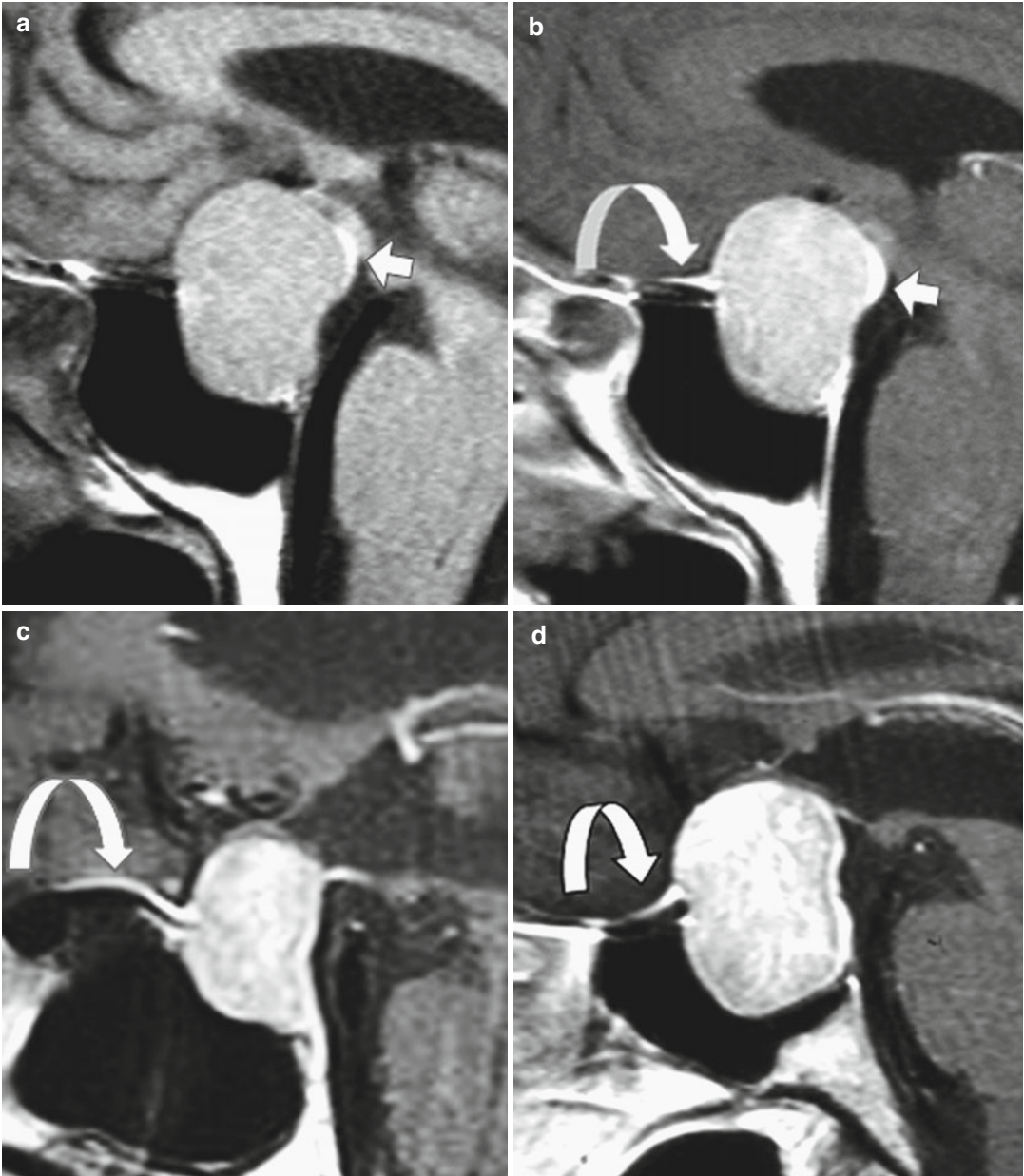
Lateral extension in the cavernous sinus, usually unilateral, is present in about 30 % of cases. This is extensively described in Chap. 11.



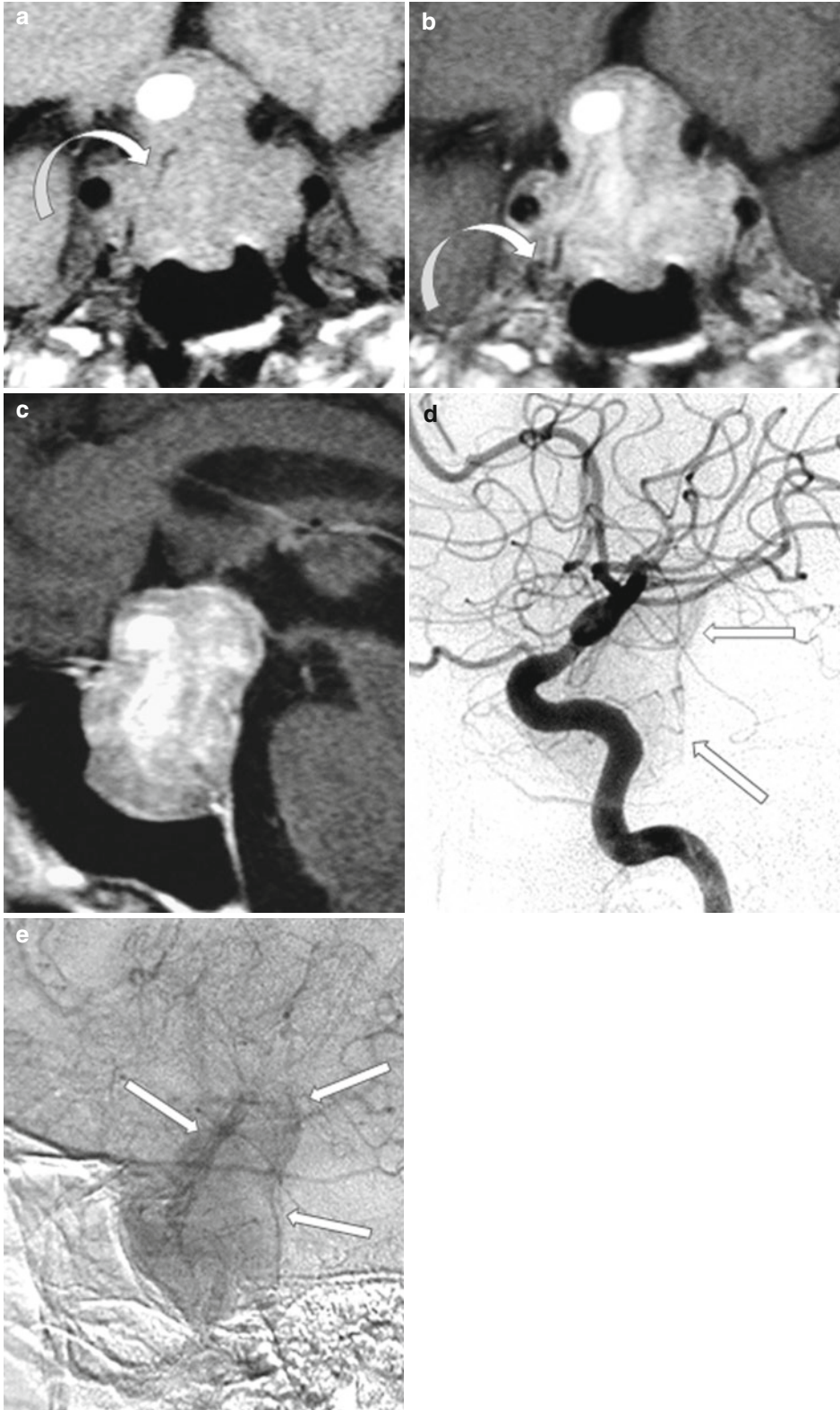
**Fig. 4.3** Pituitary macroadenoma with suprasellar extension discovered fortuitously. (a) Sagittal T1WI. (b–d) Axial T1, T2 and T2\* WIs. Intratumoral hypointensities reflecting old hemorrhage are demonstrated on T2\*WI only (arrow)



**Fig. 4.4** Macroadenoma abutting the optic chiasm (*curved arrow*) (a, b) Sagittal and coronal T1WIs. (c, d) Coronal T2 and CE T1 WIs. The normal pituitary tissue is demonstrated on the right side (*thick arrows*)

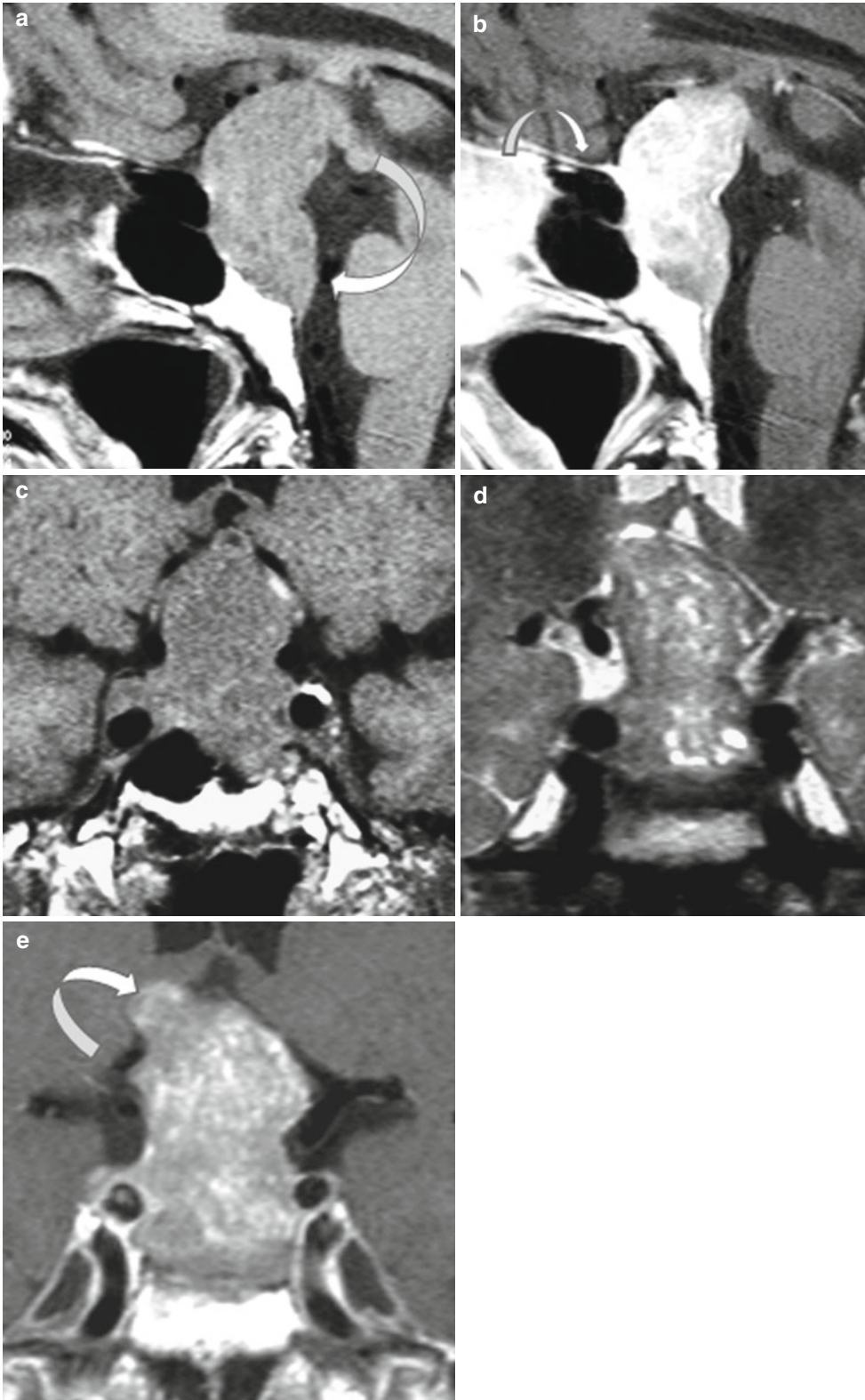


**Fig. 4.5** Macroadenoma with ectopic posterior lobe (*short arrow*) and dural tail (*curved arrow*). (**a, b**) Sagittal T1 and CE T1 WIs. (**c, d**) Sagittal CE T1WI: dural tail (*curved arrows*) in two cases of nonfunctioning macroadenomas



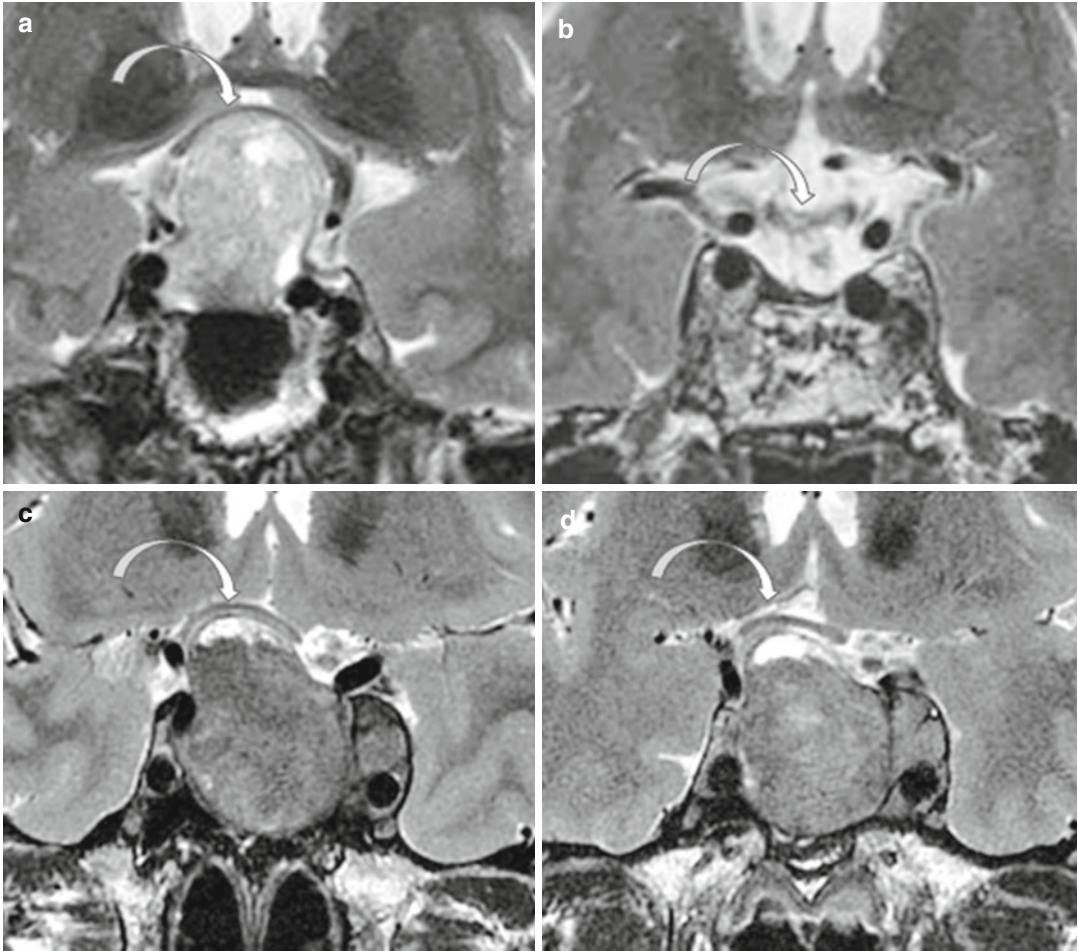
**Fig. 4.6** Macroadenoma: unusual blood supply. (a–c) Coronal T1, CE T1, and sagittal CE T1 WIs. Hemorrhagic area at the top of the lesion; running artery (*curved arrow*)

through the pituitary mass. (d, e) Carotid angiography, arterial and parenchymatous phases: arterial blush modeling the contours of the pituitary adenoma (*straight arrows*)



**Fig. 4.7** Macroadenoma and clival invasion. (**a, b**) Sagittal T1 and CE T1 WIs. (**c–e**) Coronal T1, T2, and CE T1WIs. Erosion of the dorsum sellae and clivus (*large curved arrow*), dural tail (*small curved arrow*); lobulated contour (*curved arrow in e*)





**Fig. 4.8** Nonfunctioning pituitary adenomas with huge suprasellar extension and optic chiasm compression. (a) T2WI. The optic chiasm is compressed and thinned (*arrow*). Three months after surgery (b), the optic chiasm is now repositioned, but its T2 signal is heterogeneous and T2 hyperintense, indicating a chronic lesion of the optic nerve fibers and a poor long-term visual prognosis. (c, d)

Pituitary macroadenoma with cavernous sinus and suprasellar extension on T2WI in a different patient. The optic chiasm is raised (*curved arrow*) with a rail-like pattern probably related to edema. Three weeks after partial debulking (d), the optic chiasm is less compressed and the rail-like pattern has vanished

## Further Reading

Chen X, Dai J, Ai L et al (2011) Clival invasion in pituitary macroadenomas. *Am J Neuroradiol* 32: 785–789

Chen Y, Wang CD, Su ZP et al (2012) Natural history of postoperative nonfunctioning pituitary adenomas: a systematic review and meta-analysis. *Neuroendocrinology* 96(4):333–342

Molitch ME (2014) Nonfunctioning pituitary tumors. *Handb Clin Neurol* 124:167–184