On a coronal section through the brain the reference structure is the pituitary gland which lies in the sella turcica.

- It is usually larger in females than in males - in females the superior border tends to be convex, whereas in males it is usually concave.

- The most common abnormalities that arise in the pituitary gland are pituitary adenoma, Rathke's cleft cyst and craniopharyngioma.
By definition, pituitary microadenomas are less than 10 mm in diameter and are located in the pituitary gland.

These images show a classic case:
- Slightly hypointense T1 a lesion compared to normal pituitary tissue about 3-4 mm.
- On T2, the lesion is slightly hyperintense.

The differential diagnosis:
- Pituitary microadenoma
- Rathke's cleft cyst (the two can be indistinguishable).

It is not always necessary to give intravenous contrast for detecting pituitary microadenomas as patients with a negative scan generally receive the same symptomatic treatment as patients with a microadenoma (usually these patients are women with symptoms of hyperprolactinemia).

However Dynamic MRI can pick-up lesions that wouldn't have been seen on conventional MRI scans.
In possible surgical candidates it is necessary to give contrast to localize the lesion as accurately as possible.
Pituitary Macroadenoma

- By definition:
  - Pituitary macroadenomas are adenomas over 10mm in size.
  - They tend to be soft, solid lesions, often with areas of necrosis or hemorrhage as they get bigger.
  - As they grow, they first expand the sella turcica and then grow upwards.
  - In this example of a pituitary macroadenoma there is suprasellar extension with elevation and compression of the optic chiasm.
  - Because they are soft tumors, they usually indent at the diaphragma sellae, giving them a 'snowman' configuration.
  - This is one feature that can help distinguish between a pituitary macroadenoma and a meningioma.
  - Another feature which can help differentiate them is enlargement of the sella turcica - this generally only occurs with pituitary macroadenomas that originate in the sella.

Notice the blood-fluid level, indicating hemorrhage.

- On the T2-weighted images on the right you can see that the leaflets are displaced upwards by this macroadenoma which started in the sella and is growing upwards.
- A lesion originating above the sella and growing downwards would push the leaflets in the other direction (this can be seen with meningiomas for example).
Because the pressure above the dura is larger than the pressure below, the macroadenoma then delivers itself into the sphenoid sinus.

Another common pathway of extension is laterally into the cavernous sinus.

Rathke's cleft cysts can occur either in or above the sella turcica.

On the images above there is a normal pituitary gland, a normal optic chiasm and a normal carotid artery on each side.

The mass has a high signal intensity on the unenhanced T1-images.

Now the only two things that are this bright on unenhanced T1-weighted images are either fluid (blood or proteinacious fluid) or fat. Solid masses are not this bright.

Therefore it is most likely a cystic structure originating from the pituitary stalk, probably a Rathke's cleft cyst.
Craniopharyngioma

- There is a large intrasellar and suprasellar mass with cystic and enhancing components as well as calcifications.
- These findings in a child are virtually pathognomonic for craniopharyngioma.

Meningioma

On the top-left unenhanced and enhanced CT-images, the main differential diagnosis of the enhancing mass would include meningioma, pituitary adenoma and an aneurysm. The post-contrast MR-image on the top-right rules out an aneurysm as a possible diagnosis (no flow void), but on axial images a pituitary adenoma and meningioma are still difficult to differentiate.

Notice the spread of the lesion along the meninges. The epicentre of the lesion is above the sella.
The lesion partly in the right cavernous sinus and partly in the sella turcica is predominantly black on this T1-weighted image.

In general there are three things that are black on MRI: air, bone and rapid blood flow. In this case it is black due to rapid blood flow in a carotid aneurysm.

This is an example of a partially thrombosed aneurysm in the suprasellar cistern. The patent lumen is black on these T1-weighted images. It is surrounded by clot of different ages arranged in layers reaching from the lumen to the wall. It resembles an onion cut in half.
Hamartomas are masses of dysplastic tissue found almost exclusively in young children.

These are CT images of a hamartoma suspended from the floor of the third ventricle. It does not enhance after the administration of intravenous contrast.

The best images to see hamartomas on are enhanced sagittal T1-weighted MR images. Here you can see the non-enhancing hamartoma attached to the tuber cinereum between the pituitary stalk and mamillary body.

“There really is no differential diagnosis.”

Hypothalamic and Chiasm Glioma

- Gliomas can occur in any part of the brain and the optic chiasm is a common location, particularly in patients with neurofibromatosis type 1.

A right-sided optic nerve glioma with enhancement after gadolinium.

Note the normal pituitary gland and stalk.

Note the enhancement of the nerve after intravenous contrast with sparing of the meninges.
Germinoma

- This case concerns a 9-year-old male with a history of headache, nausea and vomiting.
- Sagittal T1 images before and after intravenous contrast show a mass in the midline, on the floor of the third ventricle.
- The mass enhances after gadolinium.

T2- and T1-weighted sagittal images of the same patient show a similar mass in the epiphysial area. This is a germinoma - an intracranial germ cell tumor that occurs primarily in children and adolescents. These are typical localisations.

Chordoma

Chondromas are the most common lesions of the clivus, also a favored location for metastases and chondrosarcomas.

- A large, fungating mass positioned at the level of the clivus.
- The CT shows some calcifications in this area.
- Chordomas tend to occur in the midline, whereas chondrosarcomas tend to occur off the midline.
Metastases

- A patient with lung cancer who presented with a sixth cranial nerve palsy.
- The abnormality is in the clivus, which should have a high signal intensity on this sagittal T1-weighted image (as in the image on the left).
- A low signal intensity means the normal fatty marrow has been replaced by some other tissue.
- .......In this case by tumor metastasis.
- Also lymphomas, myelomas or diffuse bone abnormalities can give this appearance.

Summary...

Pituitary Gland

Adenoma
Rathke Cleft Cyst
Craniopharyngioma
Summary...

Pituitary Stalk
Rathke Cleft Cyst
Craniohypophyseal Cyst
Germinoma
Eosinophilic Gran.
Metastasis

Summary...

Optic Chiasm
Glioma
Demyelination
Summary...

Cavernous Sinus
Schwannoma
Inflammation
Car-Cav Fistula

Summary...

Meninges
Meningioma
Inflammation
Summary...

Sphenoid Sinus / Skull Base
Squamous Cell Carcinoma
Chordoma
Sarcoma
Metastasis
Inflammation

Thank You