IMAGING OF SELLA

Lecture of Prof Mamdouh Mahfouz

Normal

- **Concave upper border of pituitary gland**
- **Homogenous enhancement of the pituitary gland**
- **normal height [less than 8mm] and regular contour**
- **Midline infundibular stalk**
- **Clear suprasellar cistern**

- **Diameters** :

AP 16 mm X ***Depth*** 14 mm

SCAN PROTOCOL			
MRI		CT	
• ***Scout***		***Scout***	Saggital
• Axials	T2 Brain	***Slice***	5 mm
• Coronal	T1	***Scans***	- **Axial** // Skull base - **Coronal** perpend. on Base - Bone & Soft - + C
• Sagital	T1		
If + Contrast	Ax. – Sag. – Cor T1		
Slice Thickness	3 mm		
MANDATORY			

MR shows isointense signal of the pituitary gland to the brain parenchyma in T1 and T2 WIs

Absence of high signal of the posterior pituitary in T1 WIs is usually, but not always, associated with

diabetes insipidus

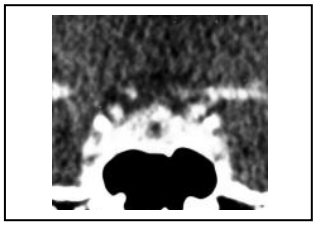
• Intrasellar Pathology

- Empty Sella
- Pituitary Cyst
- Pituitary Adenoma :
  *Micro *Macro
- Invasive Adenoma
- Sellar Abscess
- Choristoma
- Rathk's cleft Pouch
- Mets

Empty Sella

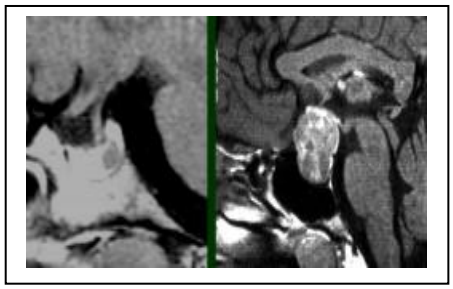
- Very common
- Pituitary flattened at Floor → **S**ella filled with CSF & **I**nfand. dipping
- **Etiology**: -1ry & -2ndry ← * Post operative *Sheehan syndrome (post partum circulatory collapse)

Pituitary Cyst



- Non neoplastic pituitary cysts → about **20%** of autopsy specimens

Pituitary Adenoma



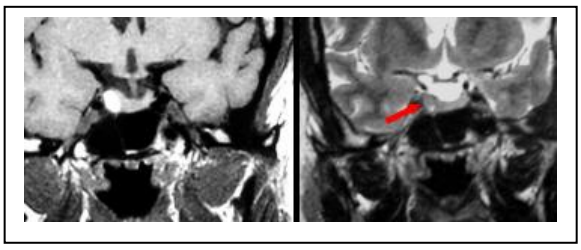
- Commonest Intrasellar tumor in adults
- Rare < age of 18 years [3%]
- **10mm** or less → **Micro**adenomas
- > 10mm → **Macro**adenomas

MICROADENOMA

- **75 %** Functioning - **50 %** of functioning = Prolactinoma
- **MRI :** - 95 % low T1WI **5o% High T2WI**
  - **High T1WI = hemorrhage**

Normal serum prolactin **< 20ng/ml**

>150 ng/ml is diagnostic of adenoma



- Convex upper border of pituitary gland
- Contra lateral stalk deviation

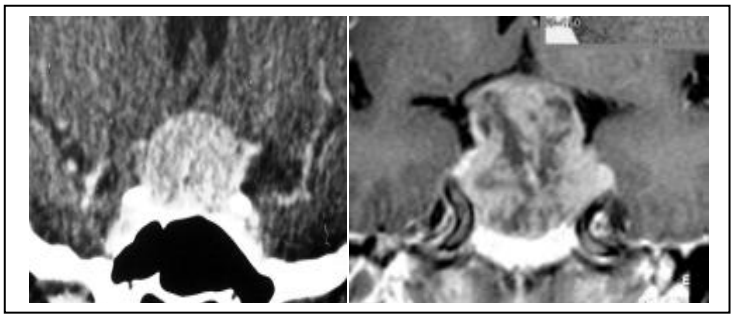
NB Tilt of the pituitary stalk may be normal variant

Micoadenoma in Dynamic MRI :

Delayed 30-60 minutes after contrast injection →[enhancing adenoma after contrast washout from the normal gland]

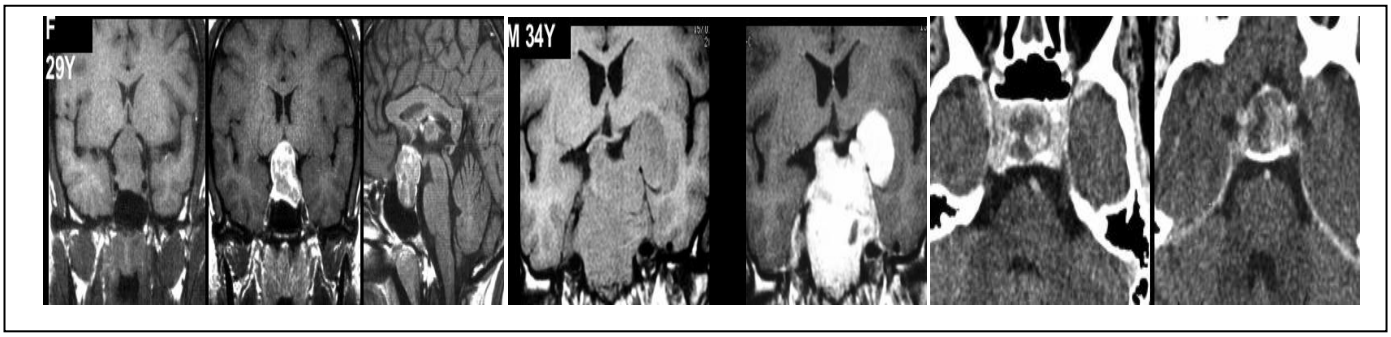
MACROADENOMA

- Pituitary Adenoma > 10 mm
- 30:50% suprasellar extension.
- Enhance : Homo or Hetero
- Calcification : Rare "1%"
- +/- Hage , Cyst



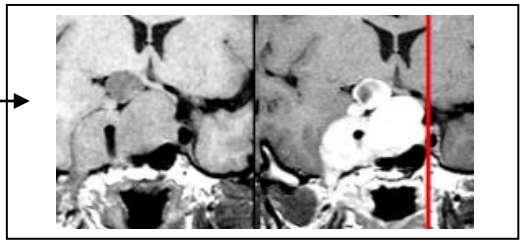
CT : Relatively hyper dense lesion
Heterogeneous enhancement
Cystic changes 5-18%

MRI : T1 isointense signal
T2 hyperintense signal



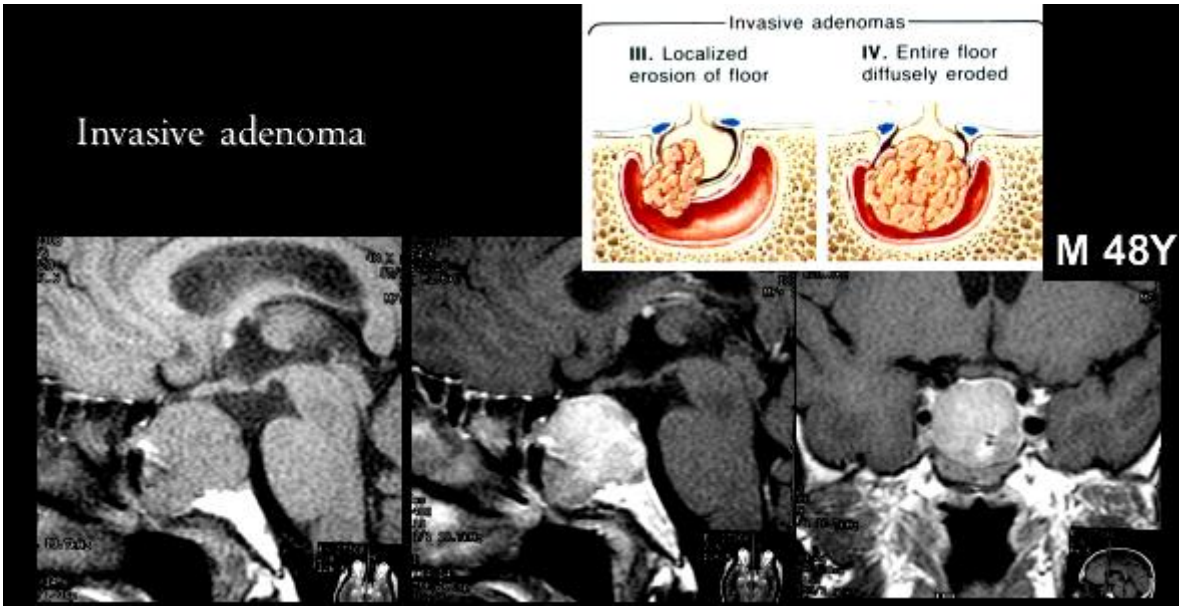
⇨ *IN Macroadenoma , imaging must assess its extension* : "Supra , para & infra"

- Suprasellar : **C**ystern , **C**hyasm , Hypothalamus
- ParaSellar : **C**avernous sinus
- InfraSellar : Sphenoid Sinus

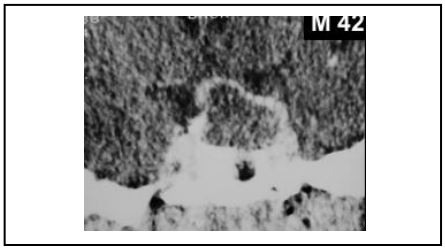


Macroadenoma Hemorrhage

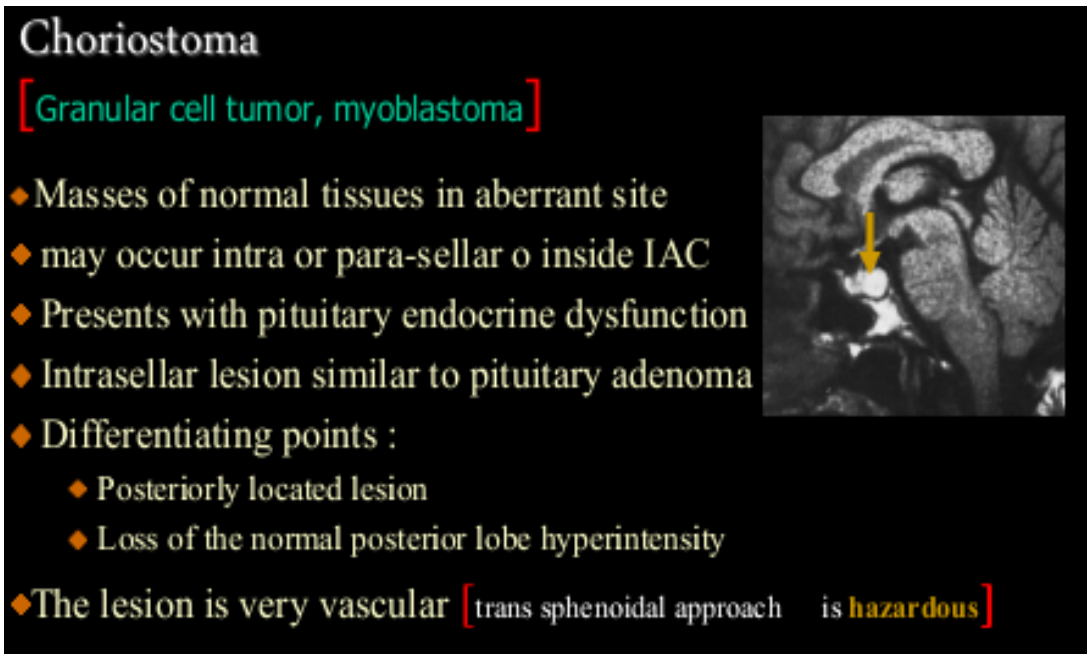
- 20 – 30 % of Adenomas
- High T1WI + Variable T2Wi
- **D.D.** *Craniopharyngioma* cyst [High signal in T1]
- Presence of fluid level in the lesion suggests hemorrhage



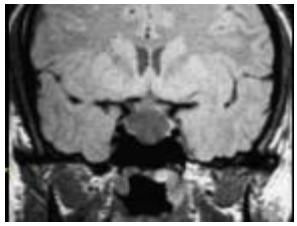
SELLAR ABSCESS



- **Symptoms** similar to adenoma rather than infection
- Cystic lesion with *marginal enhancement*
- **DD pituitary adenoma** with cystic changes .

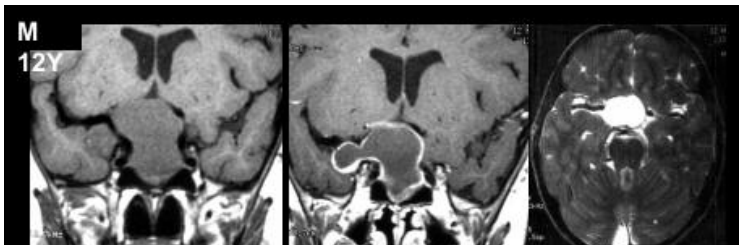


RATHKE's CLEFT CYST

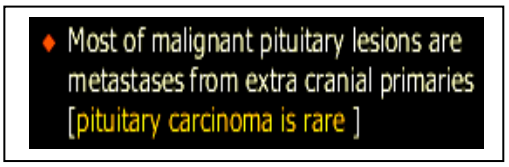


- Sellar lesion with suprasellar extension.
- Arise from the **Craniopharyngeal duct**

  [Epithelial structure connects the **nasopharynx** with **3rd ventricle**, Involutes during fetal life]
- **C**yst + **No solid** components + Marginal enh. / **Ca** uncommon
- → Displace stalk anteriorly
- D.D. **Craniopharyngioma**.



METASTASES



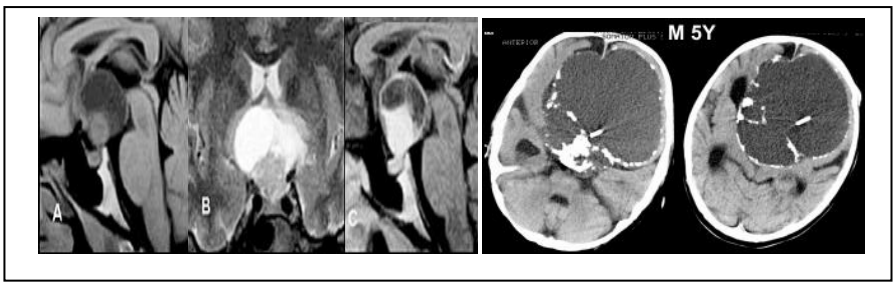
- **Intrasellar** deposits → uncommon
- Mostly occur suprasellar, parasellar, infrasellar
- Symptoms :
  - Diabetes insipidus (rare with adenomas),
  - panhypopituitarism,
  - cranial nerve palsy III, IV, VI

SUPRA SELLAR PATHOLOGY

Craniopharyngioma

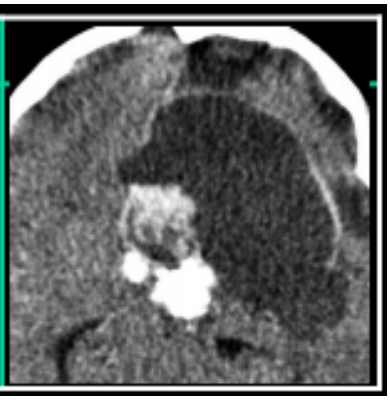
- **Incidence** :
  - 1.5 - 3% of intracranial tumors
  - 50% of suprasellar tumors in children

- **Age:** Two peaks ● *Children* 6-10 years ● *Adults* 50 years
- Occurs only in the region of the sella
- Epithelial origin [adamantinomatous, squamous- papillary, mixed]
- **Symptoms**: increased intracranial pressure
- **Rad:**
  - Suprasellar mass , Lobulated + cystic component
  - *Cystic components* [protinacious contents]→ … Hi T1 / T2 WIs be Hi or Low
  -
  - *Solid component* → strong enhancement
  - **Ca**lcification is common



  - Vascular encasement in the Adamantinomatous type not seen in other types

Item	Adamantinomatous
Incidence	More common
Calcium	Common
Cyst	Always present
Shape	Lobulated
Age	Common in children
Vascular encasement	Positive
Recurrence	Usually



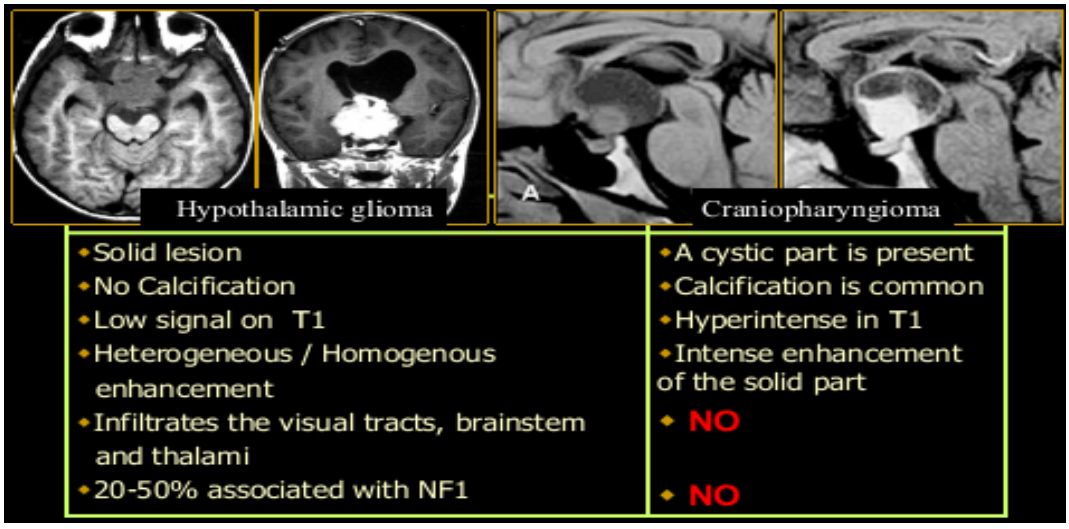
	Rathke's cleft cyst	Craniopharyngioma
Lining	Cubiodal or columnar	Squamous or basal cell
Site	Not a pure suprasellar lesion	Usually occur suprasellar
Calcificatuion	uncommon	**C**ommon
MRI signal	CSF signal	Hyperintense in T1
Solid	No solid component	+ Solid component
Enhancement	Marginal	Enhancement of solid part
Stalk Displacement	Displaces anterior	Displaces posterior
		

Hypothalamic Glioma

20-50% of neurofibromatosis type I

will develop Hypothalamic glioma

- **Incidence**: 25% of pediatric suprasellar neoplasms
- **Age :** 75% → 1st decade * M = F 1
- **C.P. :** (slow growth) → large at presentation
  - May infiltrate the **th**alamus and **B**rain stem
- CT : Isodense suprasellar mass + no calcification + Strong enhancement
- MRI : T1 isointense / T2 hyperintense
  - No hemorrhage * Enhancement similar to CT



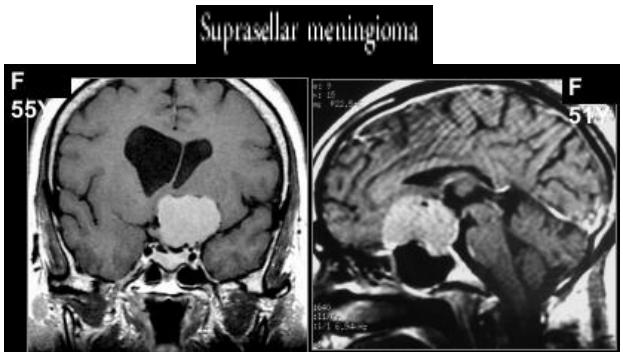
Neurofibromatosis Type I

- Autosomal dominant * 1:2500 births
- 50% had family history
- > 50% of NFI →have abnormal neuroimaging
- The main lesions include: **Hamartomas** and **Gliomas** in the orbit and brain
- Multifocal lesions in the optic nerves, brain stem, basal ganglia, dentate nuclei and periventricular white matter [Low T1, high T2 signals]
- To differentiate hamartomas Vs gliomas:
  Hamartomas ➔ No edema - No mass effect - No enhancement

Suprasellar Meningioma

- 15-25% of meningiomas
- The 2nd common Suprasellar tumor in adults
- **Origin:**
  - Sphenoid ridge,
  - diaphragma sellae,
  - tuberculum sellae
- Middle aged females

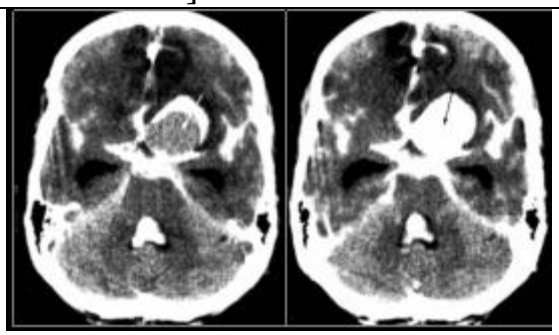
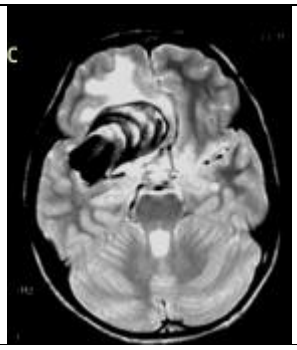
- Lobulated
- Strong Enh.
- Ca 20 %
- +/- Hyperstosis
- Vascular encasement



ADENOMA Vs MENINGIOMA

- Meningioma is separate from the pituitary
- ***Phosphorus MRS*** :
  Adenomas have a *higher phosphate monoester* peak than meningiomas

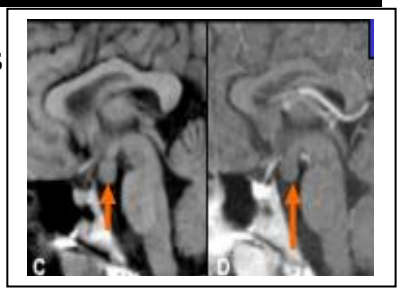
Suprasellar Aneurysm

CT	MRI
• rounded lesion • Hyper dense • +/- marginal calcification • Homogenous enhancement • Large aneurysm may contain thrombus]	- [**Patent aneurysm**] →Signal void in all pulse sequences - (**Thrombosed aneurysm**) → Laminated internal architectureof [T2]
	

Suprasellar Dermoid cyst

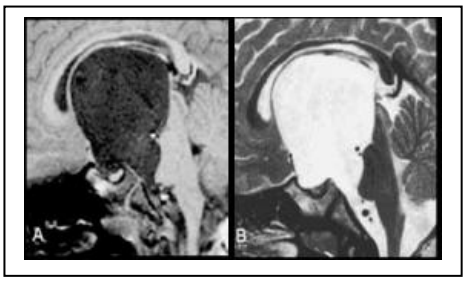
- 0.04 - 0.6% of intracranial tumors
- Inclusion of epithelium during embryogenesis
- Suprasellar is more common than vermian
- Benign, → slowly growing, cystic midline lesion
- **CT:** Fat density + **Ca**lcification
- **MR:** Fat signal [Fat saturation technique]
- Assess for rupture into ventricles or CSF

Tuber cinereum hamartoma



- Slowly growing non neoplastic lesion
- Boys > Girls
- *Presents* : with precocious puberty, Seizures or both
- **CT:** Small (2cm) isodense lesion
- **MR:** Isointense in T1 , Hyper intense in T2
- **No enhancement** * **No calcification**

Suprasellar Arachnoid Cyst



- 15% of Arachnoid cysts → in the sellar region
- **CT**: well defined, cystic, CSF containing suprasellar lesion
- **No calcification** * **No enhancement**
- **MRI:** CSF signal in all pulse sequences

Colloid cyst

= ***2%*** of All Glial Neoplasms

→ **Characteristic site**

anterior 3rd ventricle

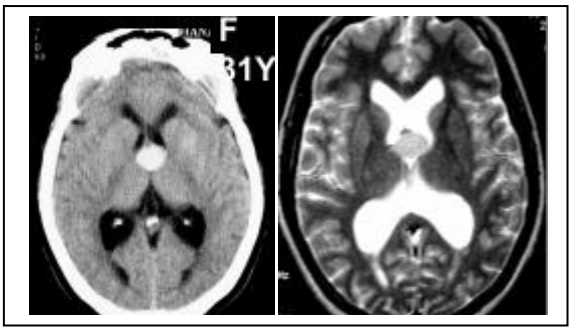
→ Characteristic contents

Dense viscid mucoid material

(*old blood, cholesterol crystals, CSF, various ions*)

→ **CT:** Hyper dense midline lesion

\+ **no enhancement**



⇨ **MRI** : "any signal depending on the contents"

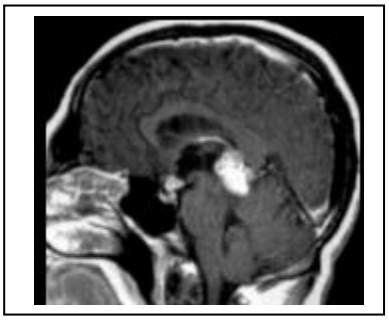
- T1 hyperintense or hypo intense
- T2 hyperintense or hypo intense

⇨ **No enhancement** [CT, MRI]

⇨ Solid enhancement → suspect other lesion

⇨ Intermittent herniation into foramina of Monro → hydrocephalus

Suprasellar Germinoma



Germinomas occur in

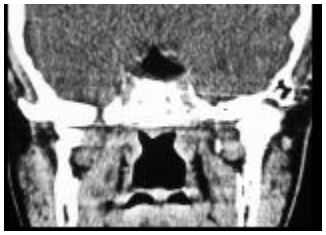
- 80% of the **pineal body** region ,
- 20% **Suprasellar**
- 6-12% of cases Synchronous Suprasellar + Pineal germ cell tumors

- Midline lesion + Homogenous enhancement.
- Cystic changes → rare
- Subependymal spread → **Enhancing nodules** in the wall of the **3rd** and **lateral** ventricles

Other germ cell carcinoma:

- Embryonal cell carcinoma
- Yolk sac tumor
- Choriocarcinoma
- Teratomas

Suprasellar Lipoma



- 1/1000 of I.C. Tumors
- **Fat density** (CT) or signal (MRI)
- No enhancement
- Adjacent to the Mammillary bodies
- *Fat saturation MR techniques* are helpful in diagnosis

Suprasellar Granuloma

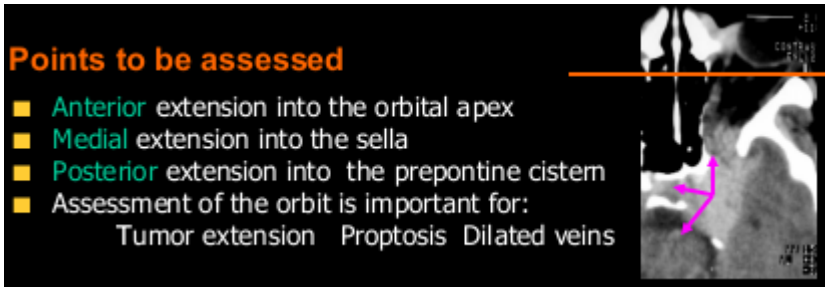
Sarcoidosis

- **Etiology :** Chronic inflammatory disease of unknown cause
- **Age:** 3rd – 4th decades
- **Symp:** Diabetes insipidus + cranial nerve affection, mainly visual disturbance
- **Finding:** Leptomeningeal thickening and enhancement along hypothalamus, tuber cinereum, mammillary bodies
- Thickened enhanced infundibular stalk

Supra and Infrasellar Metastases

- The most common **1ry lesions** are lung, breast, melanoma
- **Multiple lesions** in the sellar region affecting any anatomic structure
  - **CT** usually hypodense- *Hyper dense deposits [melanoma, hemorrhage]*
  - **MRI** signal depends on the cellularity and hemorrhage
- Solitary lesion is common [known primary is essential for diagnosis]

PARASELLAR LESIONS



- **LESIONS**:
  - Meningioma
  - Trigeminal Nerve Shwanoma
  - Chordoma
  - Carotid-Cavernous Fistula
  - Cavernous sinus thrombosis
  - Carotid Aneurysm
  - Mets