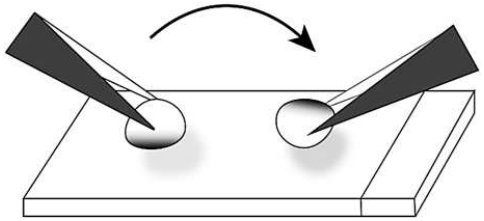
Common brain lesions with headache, visual disturbances & convulsion; Their histo-cytopathological diagnostic approach



Presenters-

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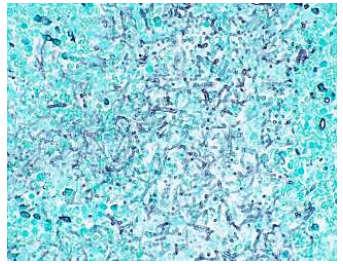
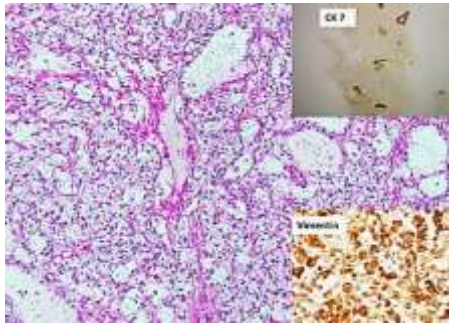
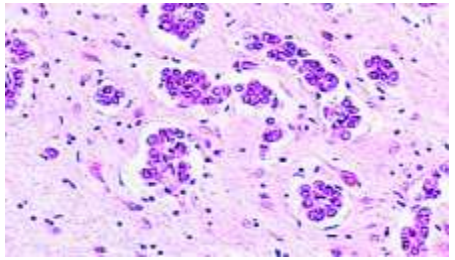






Case scenario 1

- A 45 years old female presented with H/O headache , vomiting , visual impairment and convulsion for 1 month
- The patient is normotensive and non diabetic
- She gave H/O neurosurgical operation and left sided hemiparesis 7 years back
- **Investigation:**

  MRI: Extensive crescentic intensely enhancing extra axial mass having dural tail sign is noted along both sides of the falx and both high frontoparietal convexity.

Comment: Features suggestive of extensive En plaque mass in both sides of the falx and both frontoparietal convexity as noted.

Case scenario 2

- A 50 years old male , presented with Headache and occasional seizure for 1 month
- He also gave H/O of painless hematuria 1 month
- **Investigations :**

1.Urine R/M/E : RBC

2.S.creatinine : 1.6 mg/dl

3.MRI:

Irregular mass is noted on left cerebellar region peripheral ring enhancement . The lesion shows both soft tissue and cystic components . Surrounding hypodensity represents vasogenic edema

Case scenario 3

- A 27 years old male , presented with fever , headache, retro- orbital pain & altered mental status for 20 days

- **Investigations :**

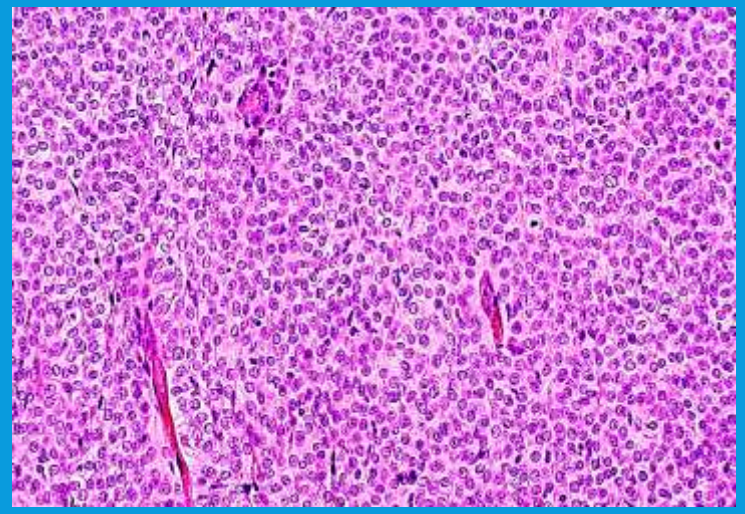
1. **CBC** : Neutrophilic leukocytosis.
2. **MRI** : Both supra and infra-tentorial multiple small gadolinium enhancing lesions.
3. **CSF study** : Lymphocytosis with raised protein ,low sugar and positive Gene Xpert assay test.

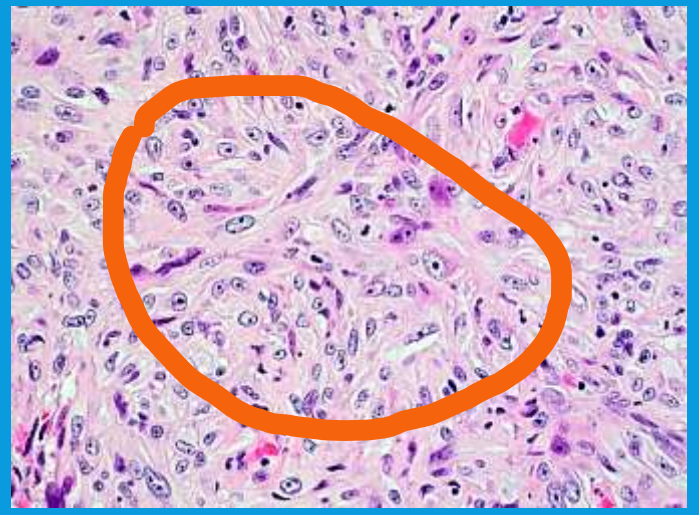
Diagnosis
?

Case scenario 1

- **Histopathology report:**

Sections show a neoplasm composed of meningothelial cells having mild atypia with macro-nucleoli . The neoplasm is hypercellular and cells are arranged in sheets & trabecular pattern . These also reveal scant mitosis.



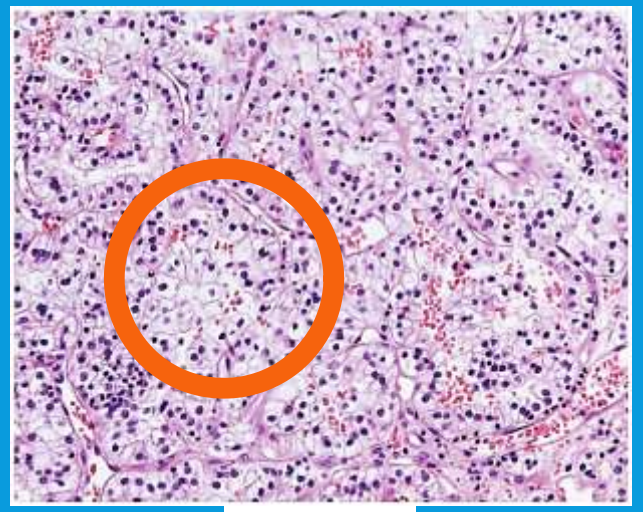


Diagnosis

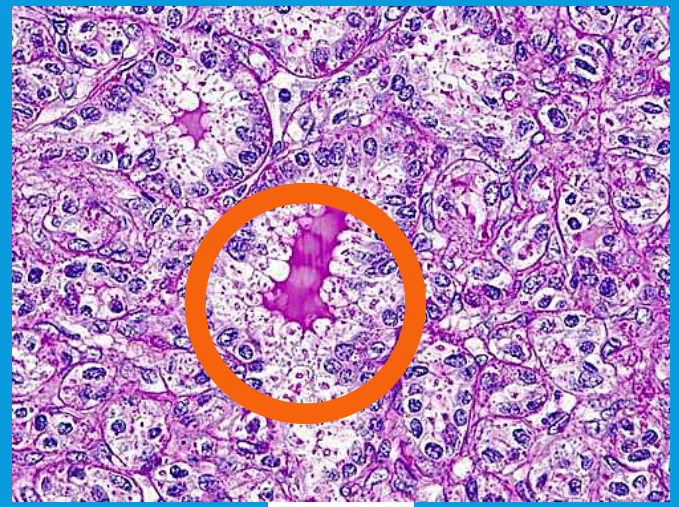
Atypical meningioma,
WHO grade 2

Case scenario 2

- **Histopathology report:**
- Sections show fragmented pieces of fibro-collagenous tissue and glial tissue . These reveal a metastatic carcinoma . The tumor cells have abundant ,clear , granular eosinophilic cytoplasm



H&E



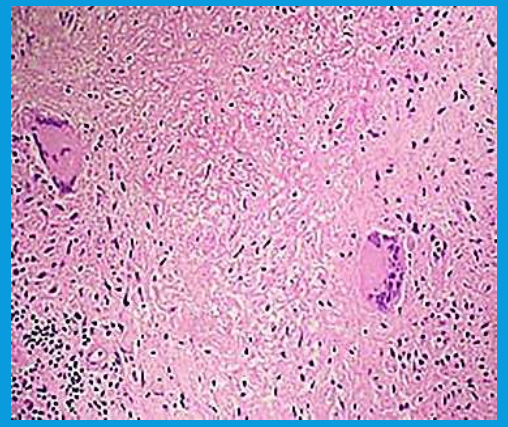
PAS

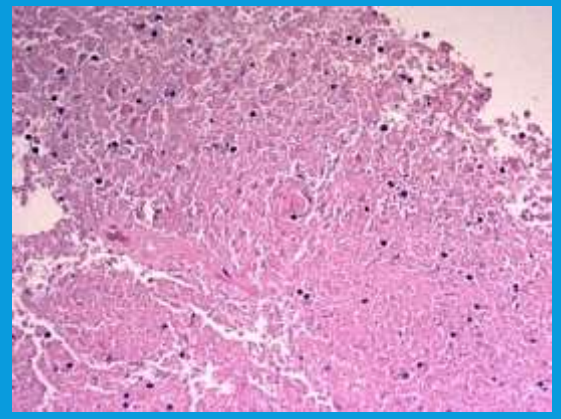
Diagnosis

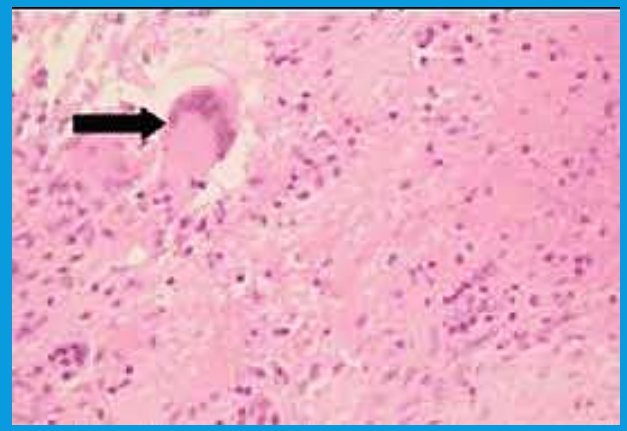
Metastatic carcinoma,
Suggested sites are kidney / Lung

Case scenario 3

- **Histopathology report:**
- Sections show brain tissue . These reveal poorly formed granuloma , scattered epithelioid cells , langhans type giant cells and areas of caseous necrosis.



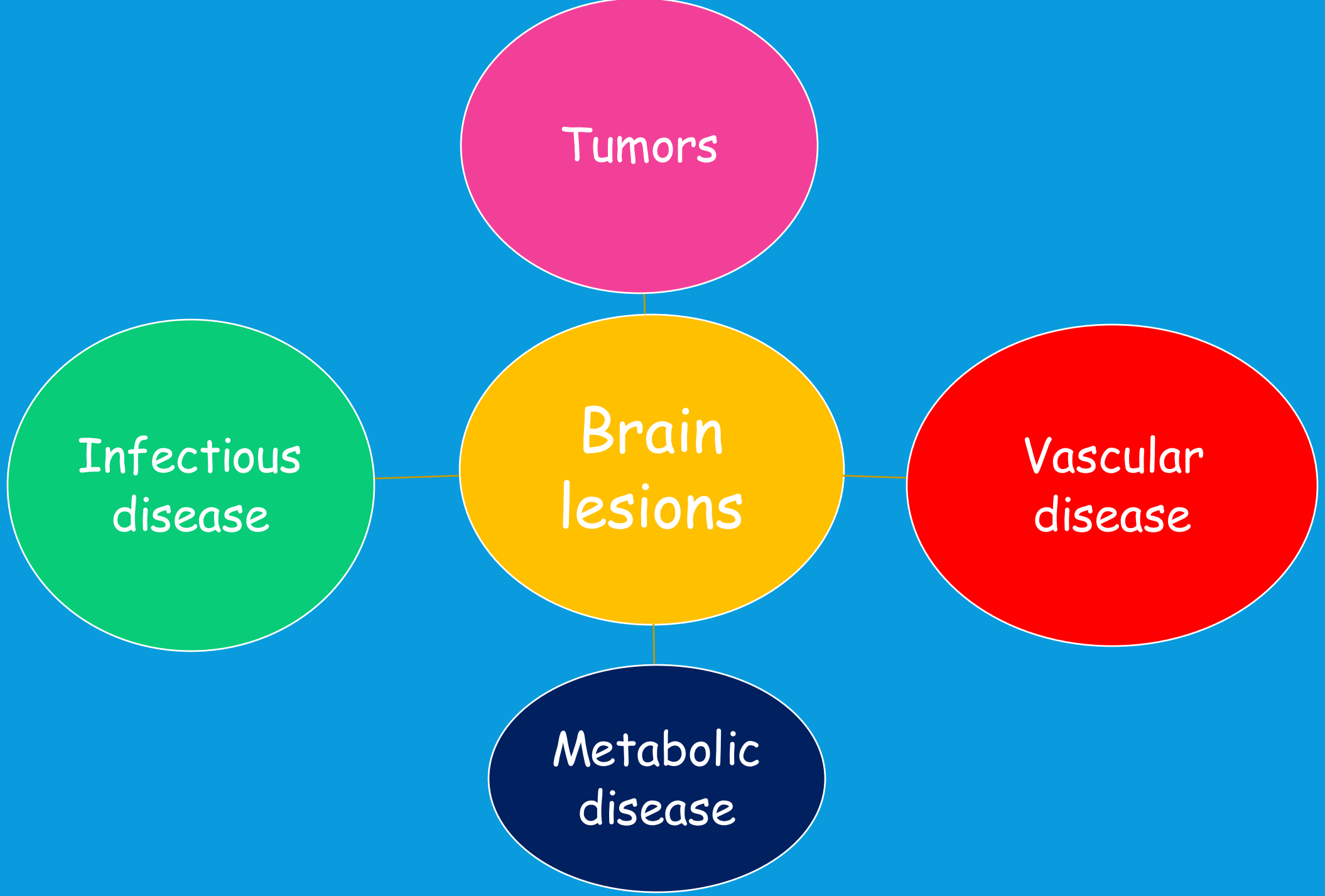




Diagnosis

Granulomatous inflammation,
suggestive of tuberculoma of brain

What are the common brain lesions?


Tumors
Infectious disease
Brain lesions
Vascular disease
Metabolic disease

Infectious disease

- **Acute meningitis**
  - Acute pyogenic (bacterial) meningitis
  - Acute aseptic (viral) meningitis
- **Acute focal suppurative infections**
  - Brain abscess
  - Subdural empyema
  - Extra-dural abscess
- **Chronic bacterial meningoencephalitis**
  - Tuberculosis & Neurosyphilis

Continue….

- **Viral meningoencephalitis**
  - Cytomegalovirus
  - Rabies
  - Arthropod borne viral encephalitis
  - Herpes simplex virus Type 1 & 2
  - HIV
- **Fungal meningoencephalitis Etc.**

Vascular disease

- Cerebral infarction
- Intracranial hemorrhage
- Cerebral venous thrombosis
- Intracranial aneurysms
- Vascular malformation
- Subarachnoid hemorrhage
- CNS vasculitis

Metabolic diseases

- Metabolic encephalopathy
- Wilson's disease
- Niemann-pick disease , type C
- Tay-Sachs disease , late onset type
- Phenylketonuria
- Gaucher disease
- Krabbe disease

Tumors of CNS

Primary tumors

Glioma , Glioneuronal tumor and neuronal tumor :
- Astrocytoma
- Oligodendroglioma
- Ependymoma
- Ganglioglioma

Meningeal tumor :
- Meningioma

Choroid plexus tumor :
- Choroid plexus papilloma
- Choroid plexus carcinoma

Tumor of Sellar region:
- Craniopharyngioma
- Pituitary adenoma
- Pituitary blastoma

Embryonal tumors :
- Medulloblastoma
- Atypical teratoid /rhabdoid tumor

Cranial & paraspinal tumor :
- Schwannoma
- Neurofibroma

Others:
- Pineoblastoma
- Hemangioma
- Meningeal melanoma
- Haematolymphoid tumors
- Germ cell tumors

Secondary or Metastatic tumors

Commonly originates from :
Lung carcinoma
Breast carcinoma
Malignant melanoma
Renal carcinoma
Colonic carcinoma
Thyroid carcinoma

Meningioma

Continue…

- Meningiomas are predominantly benign tumor of adulthood , may make their appearance in childhood or adolescence also
- **Sex:** Female predominant (specially at spinal level)
- Arise from the arachnoid cap cells and usually attached to the dura
- Accounts for 36% of all CNS tumors
- **Atypical meningioma** of intermediate aggressiveness represent about one fourth of all meningiomas and associated with higher recurrence rate

Continue…

- **Common sites:**

-Intracranial , Intraspinal or intra-orbital

- **Risk factors:**

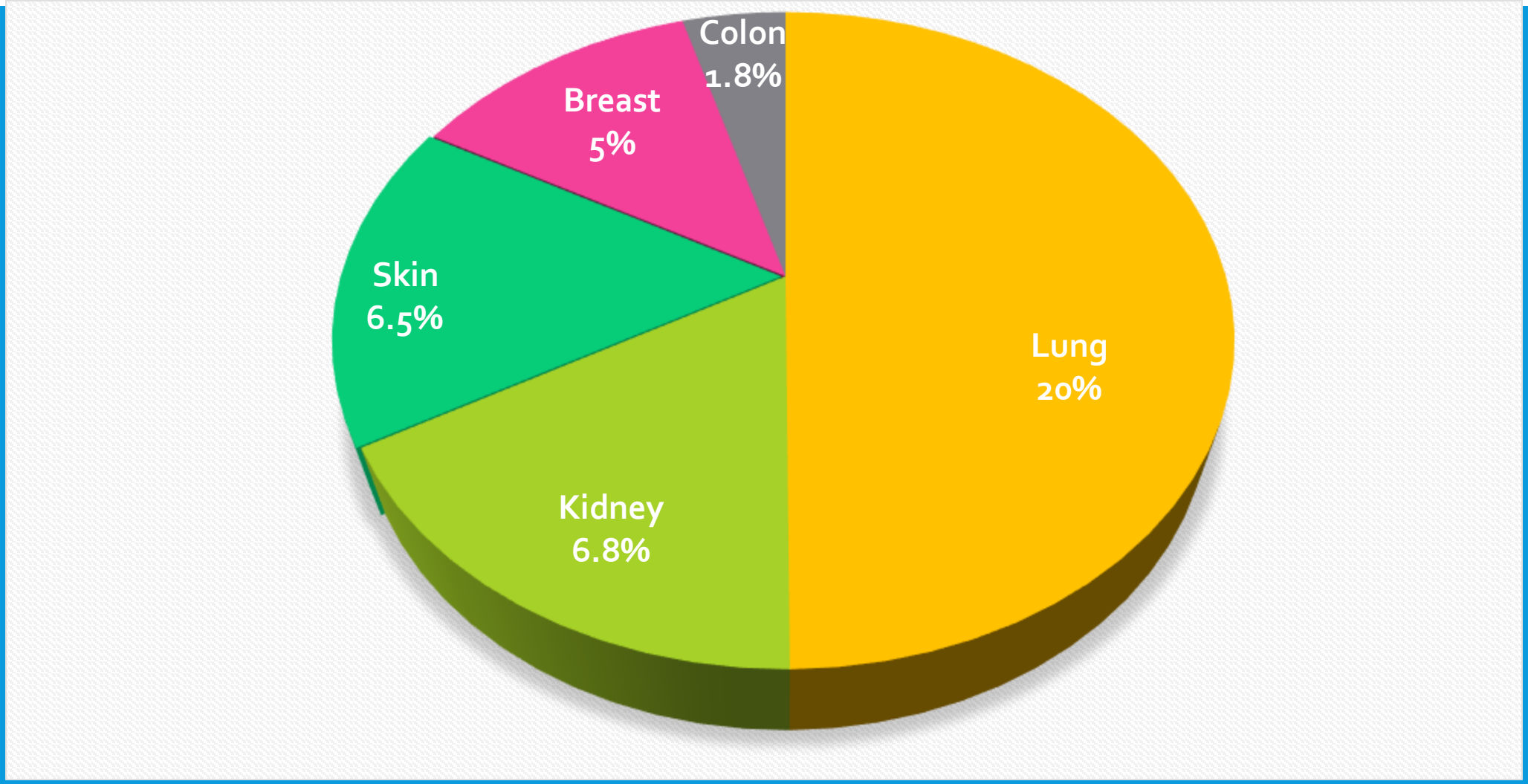
-Genetic mutation (NF2 , SMARCB1)

-Prior surgery

-Ionizing radiation

-Hormone replacement therapy

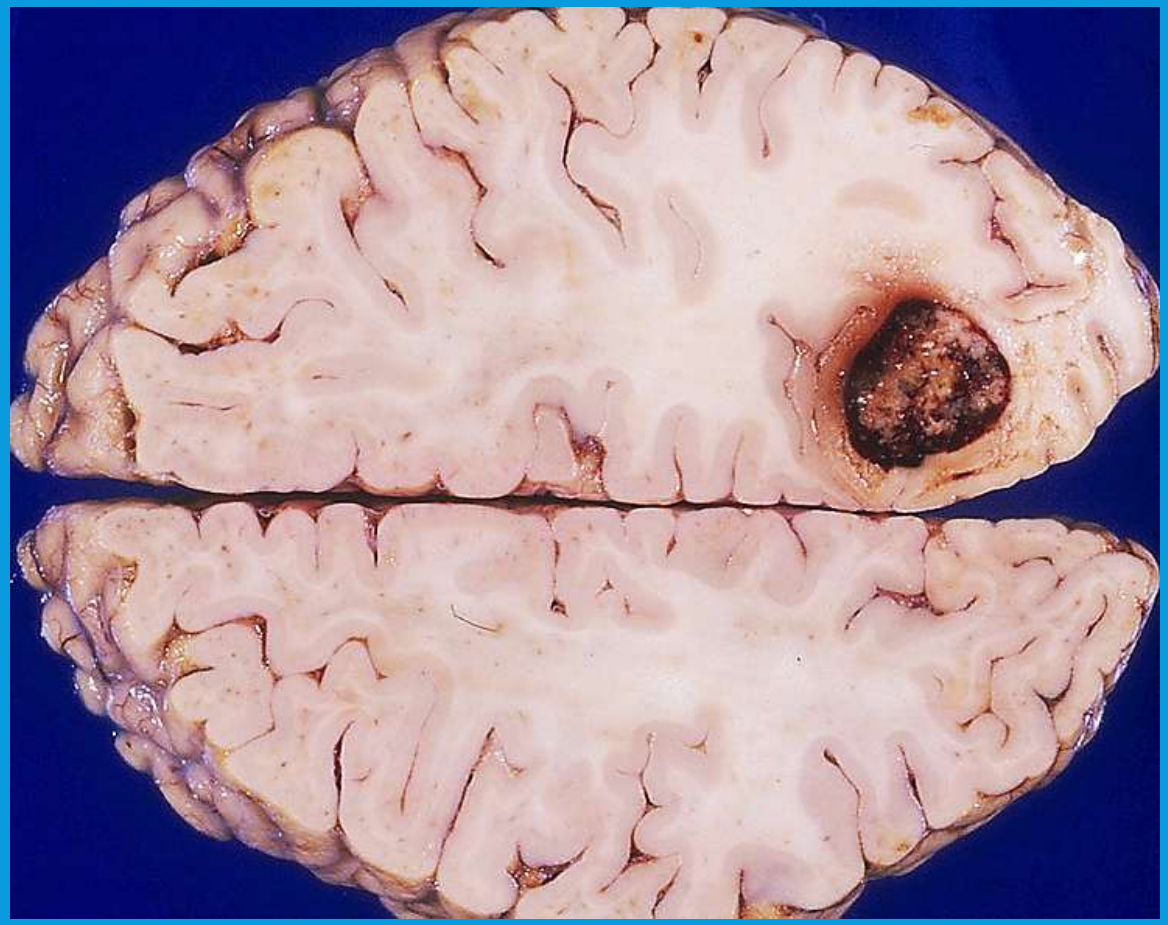
Metastatic brain tumor



Continue…

- **Route of metastasis :**
  - -Hematogenous route
  - -Retrograde spread via cranial nerves
- **Site of metastasis:**
  - -cerebral hemisphere 80 %
  - -cerebellum 15 %
  - -Brain stem 5 %
  - -Others : Leptomeninges , Subarachnoid space , dura & skull

Multifocal metastasis



Single foci of metastasis

?Diagnostic approach for brain lesions

Diagnostic approach

Radiological examination:

- Computed tomography (CT Scan)
- Magnetic resonance imaging (MRI)
- Functional magnetic resonance imaging (fMRI)
- Positron emission tomography
- Diffusion tensor imaging
- Magnetic resonance spectroscopy

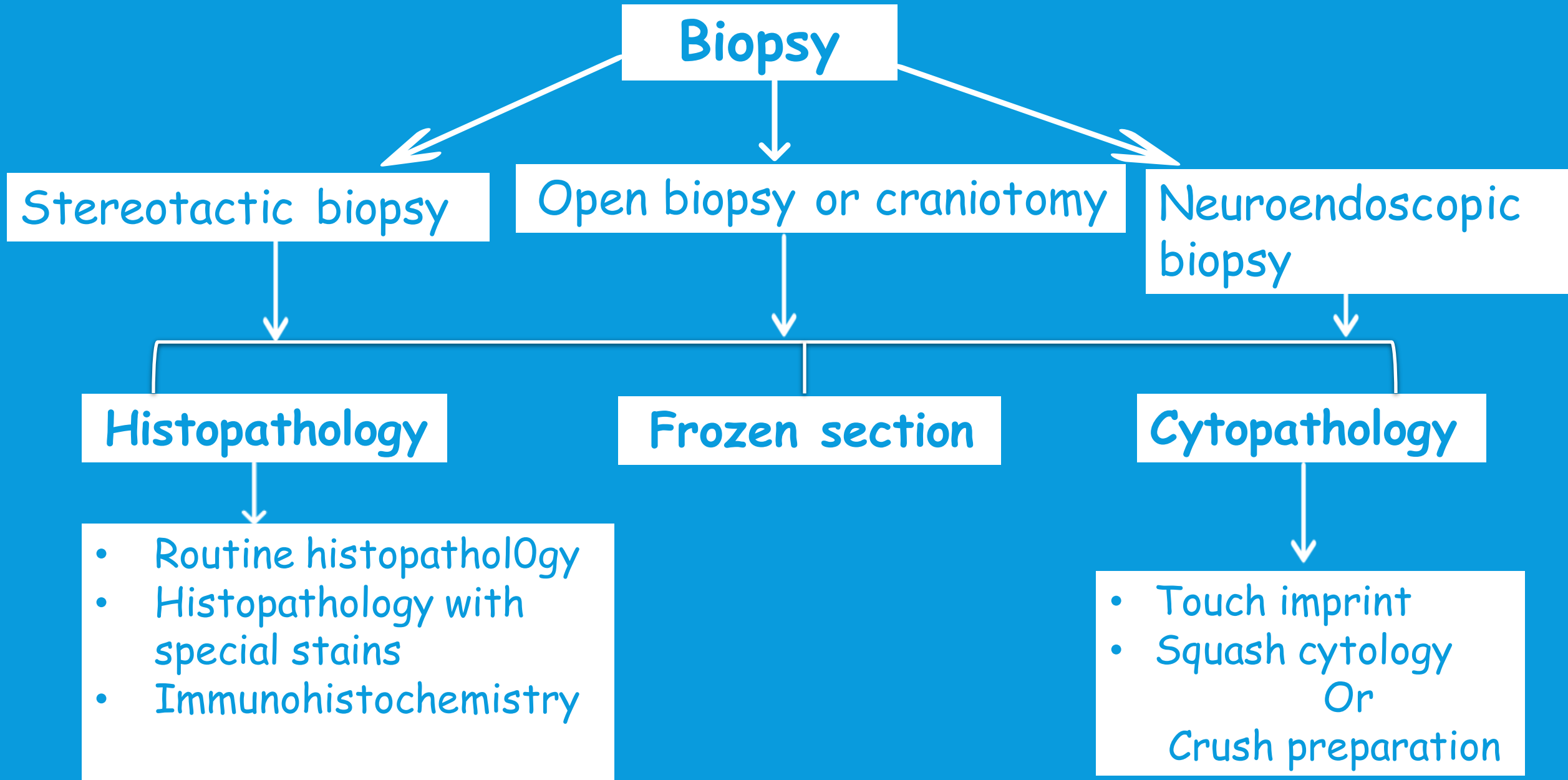
Biopsy: followed by

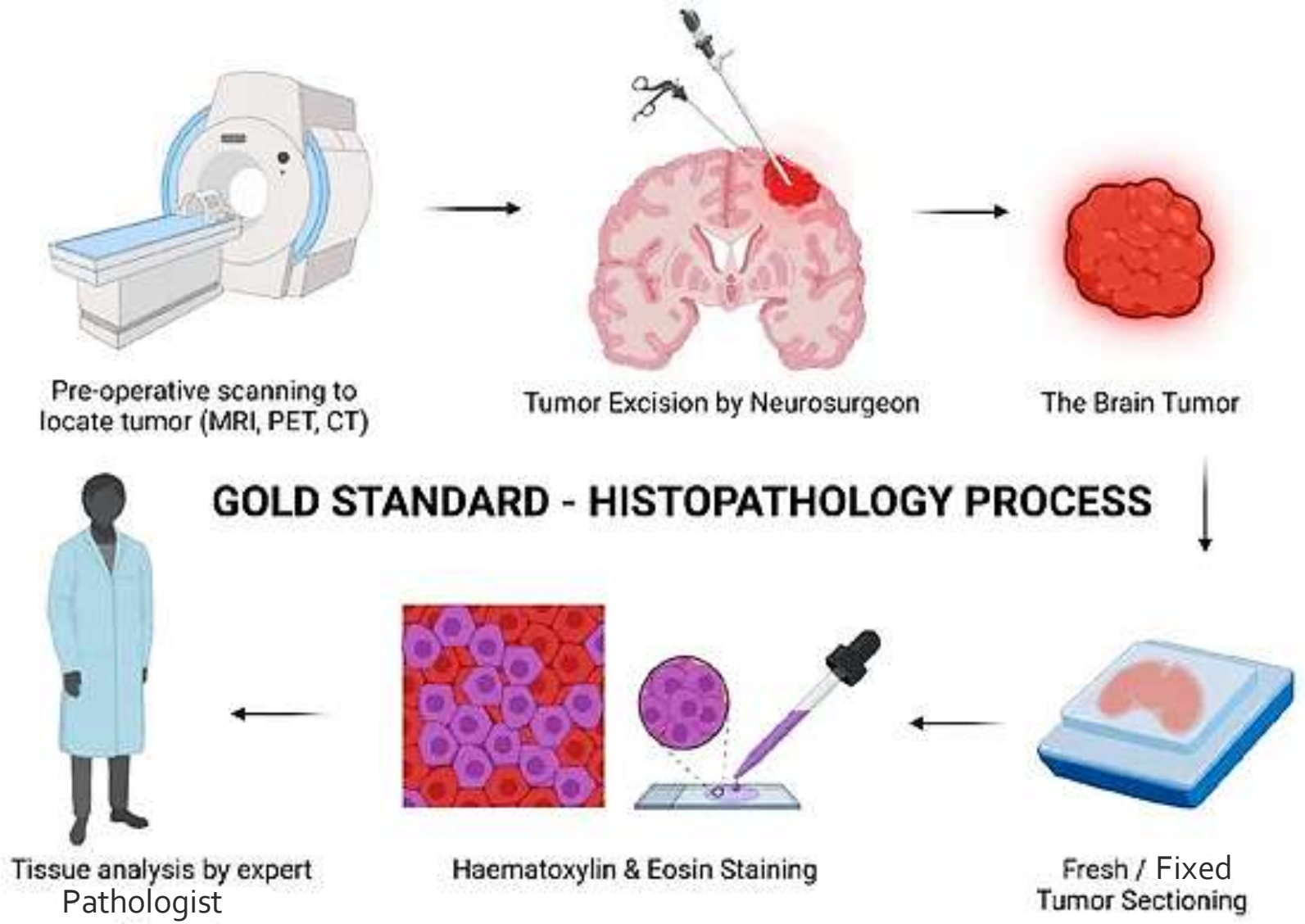
- Histopathology (With routine & special stain)
- Frozen section examination
- Cytopathology
- Immunohistochemistry

Others :

- Lumber puncture
- Cerebral angiography
- Genetic testing
- Blood & urine analysis

Diagnostic work up in pathology


Biopsy
Stereotactic biopsy
Open biopsy or craniotomy
Neuroendoscopic biopsy
Histopathology
Frozen section
Cytopathology
• Routine histopathol0gy
• Histopathology with special stains
• Immunohistochemistry
• Touch imprint
• Squash cytology
Or
Crush preparation


Pre-operative scanning to locate tumor (MRI, PET, CT)
Tumor Excision by Neurosurgeon
The Brain Tumor
GOLD STANDARD - HISTOPATHOLOGY PROCESS
Fresh / Fixed Tumor Sectioning
Haematoxylin & Eosin Staining
Tissue analysis by expert Pathologist

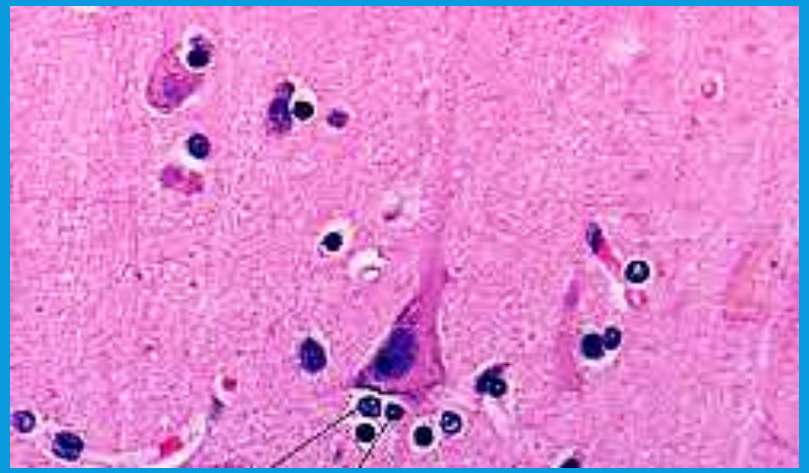
Commonly used stains in brain histopathology

For routine histopathological examination

- Hematoxylin and Eosin (H & E)

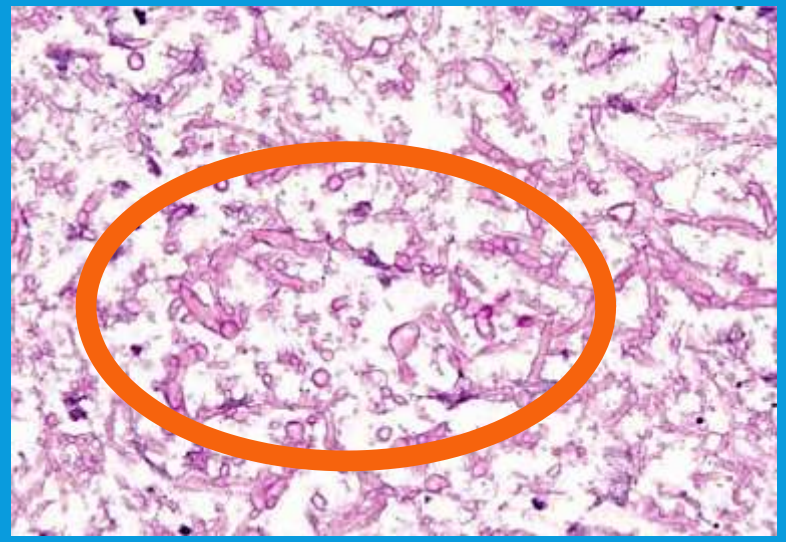
For special staining

- Periodic acid Schiff (PAS) stain
- Grocott- Gomori methenamine silver (GMS) stain
- Acid fast stain (Ziehl neelsen stain)
- Luxol fast blue stain



H&E

Silver stain



PAS

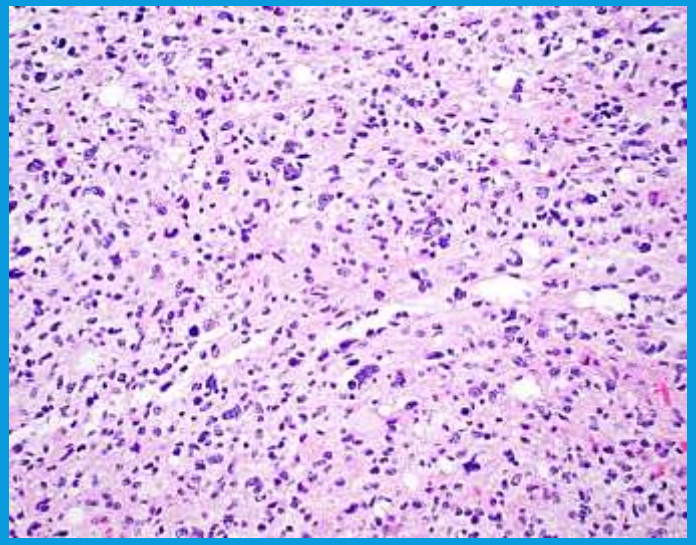
AFB stain

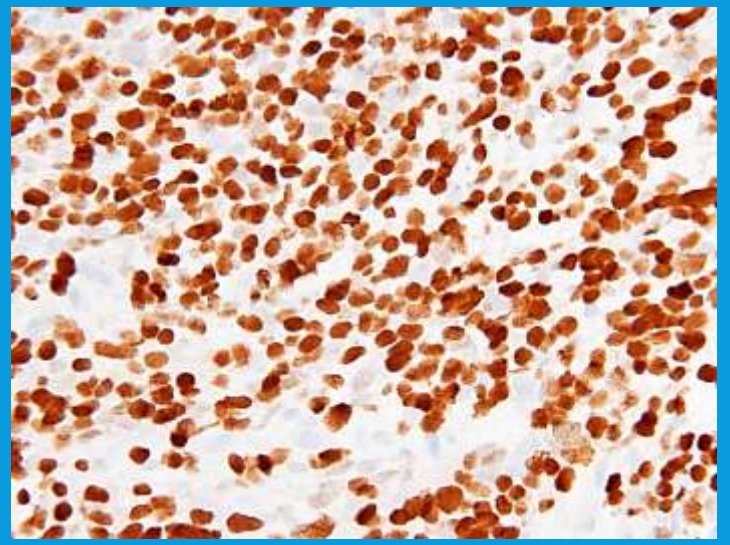
Immunohistochemistry

Glioma	GFAP,OLIG2, ATRX
Meningioma	EMA,PR, SSTR2, S100,Vimentin
Embryonal Neoplasm	GAB1,YAP1, B-catenin, Nestin, Vimentin,LIN2 8
Pituitary Neoplasm	Synaptophysin, Chromogranin , PIT1,TTF1

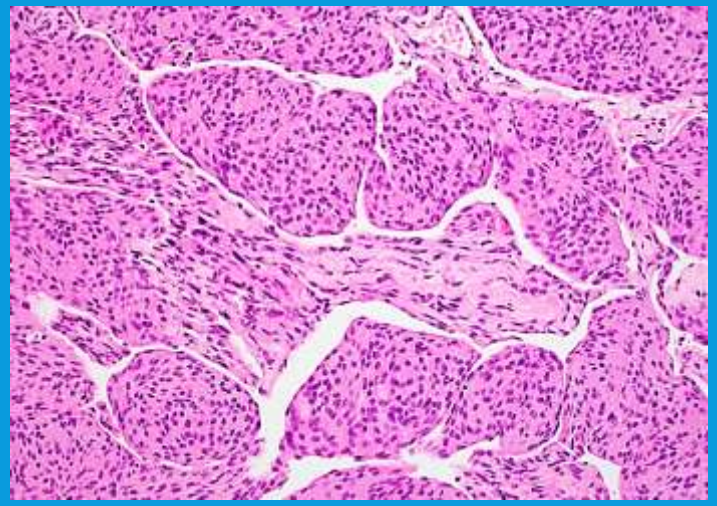
Vs

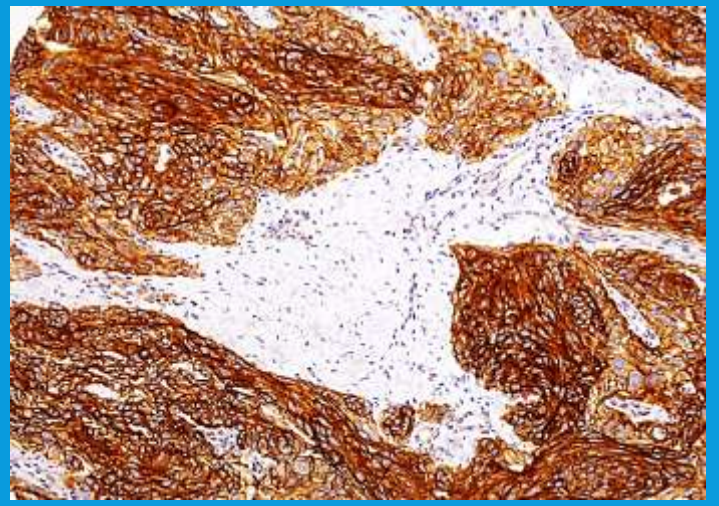
Lung carcinoma	TTF1,P40,CK7, Napsin,CD56
Thyroid carcinoma	TTF1,Thyroglobulin, PAX8
Breast carcinoma	GCDFP15,GATA3, Mammaglobin
Renal cell carcinoma	PAX8,CD10,RCCm
Colorectal carcinoma	CK20,CDX2



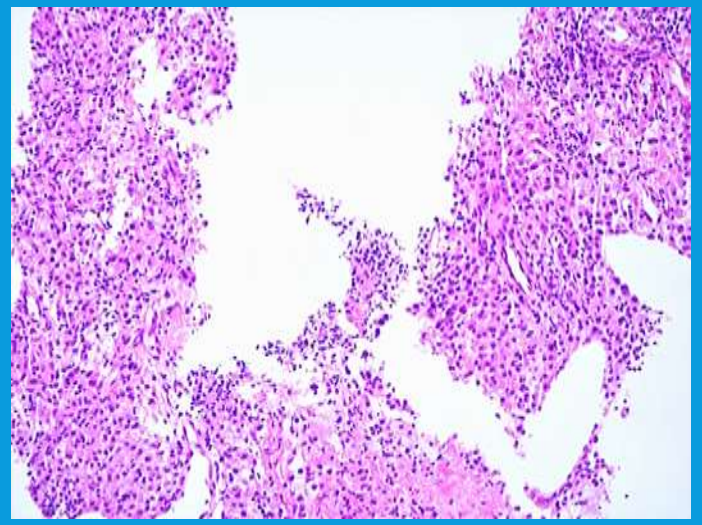


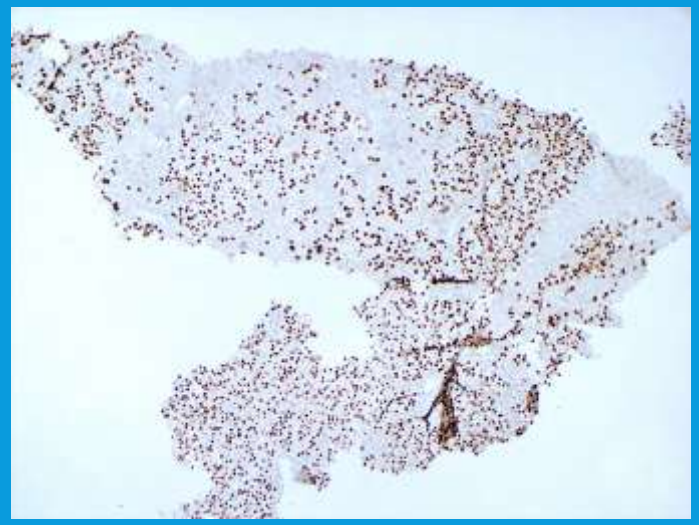
Astrocytoma stained with H&E and OLIG2



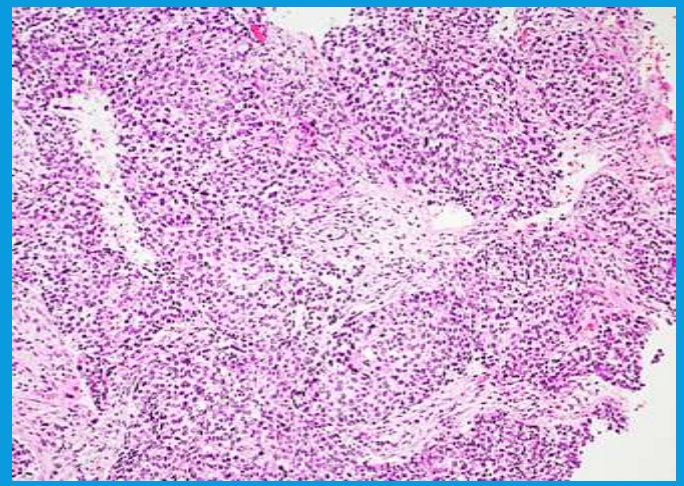


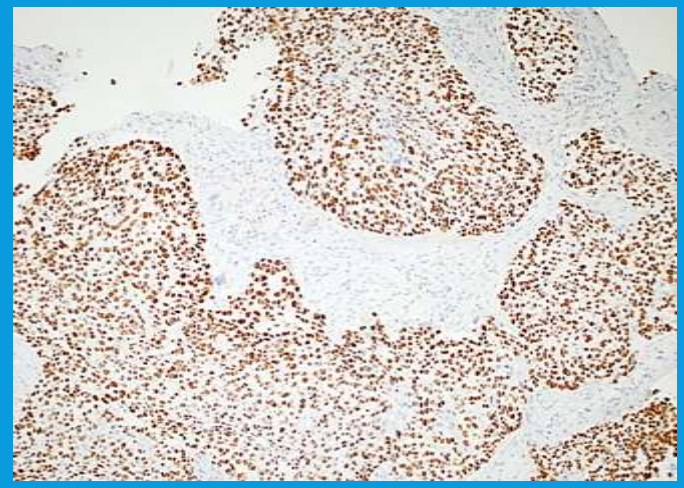
Meningioma stained with H&E and SSTR2



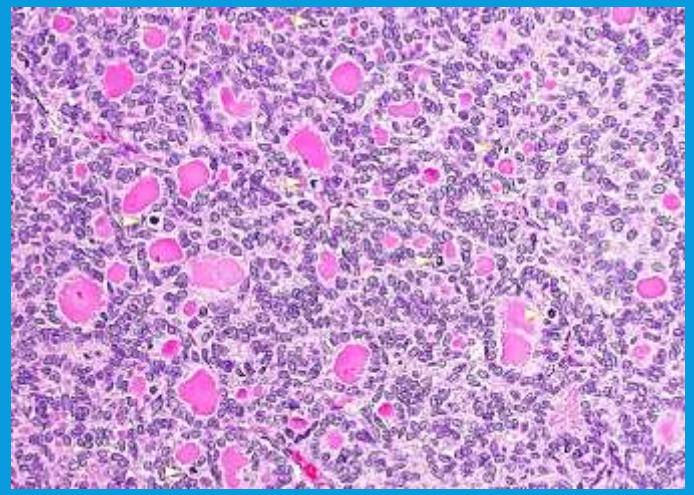


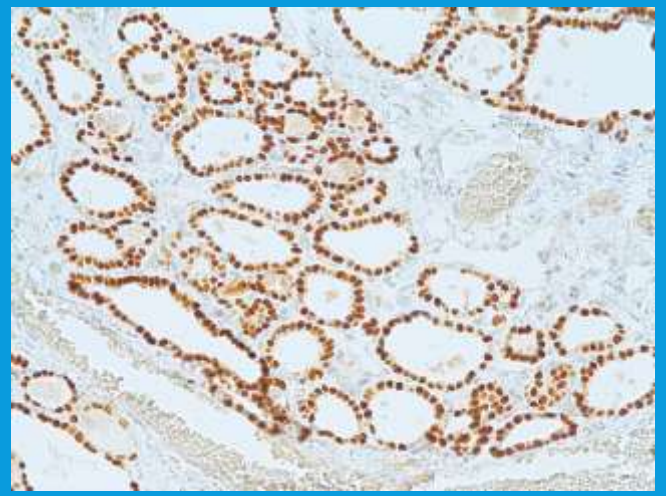
Metastatic renal cell carcinoma stained with H&E and PAX8



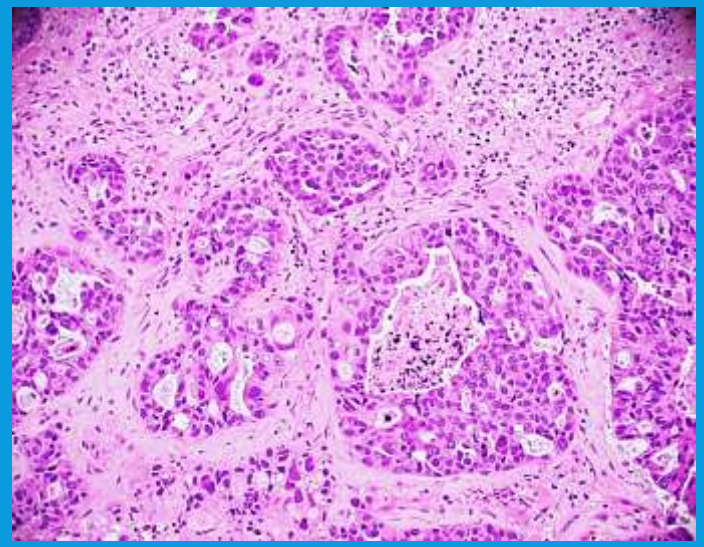


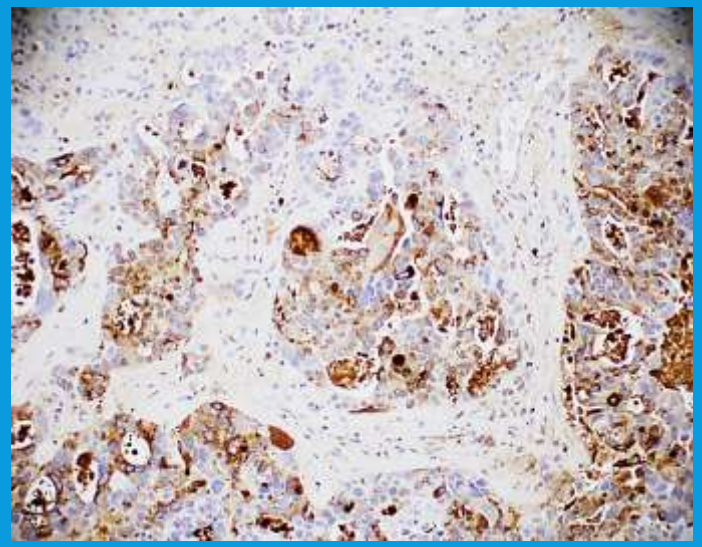
Metastatic SCC stained with H&E and P40



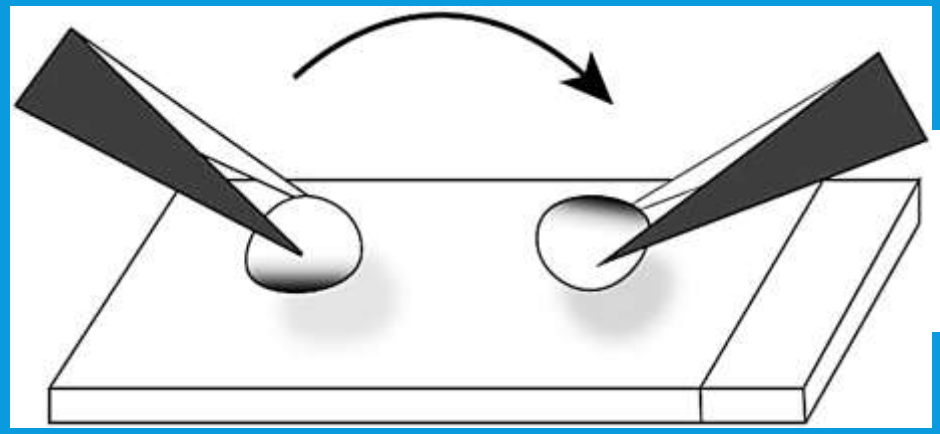


Metastatic thyroid carcinoma stained with H&E and TTF1

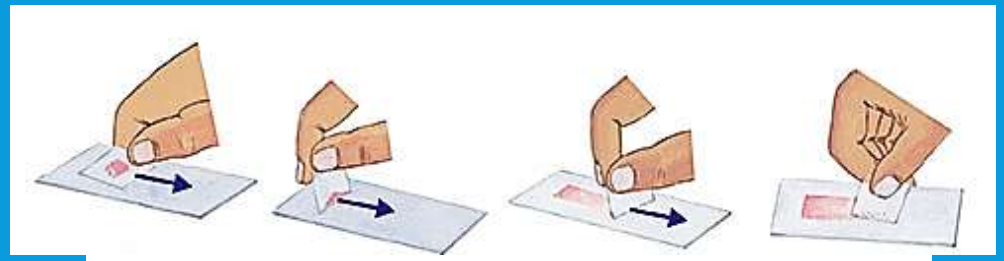




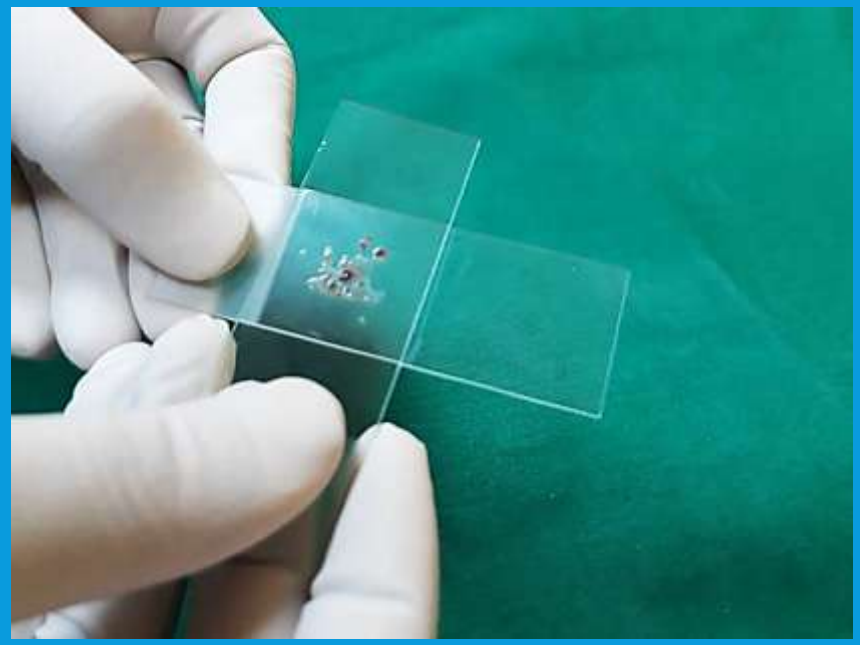
Metastatic breast carcinoma stained with H&E and GCDFP

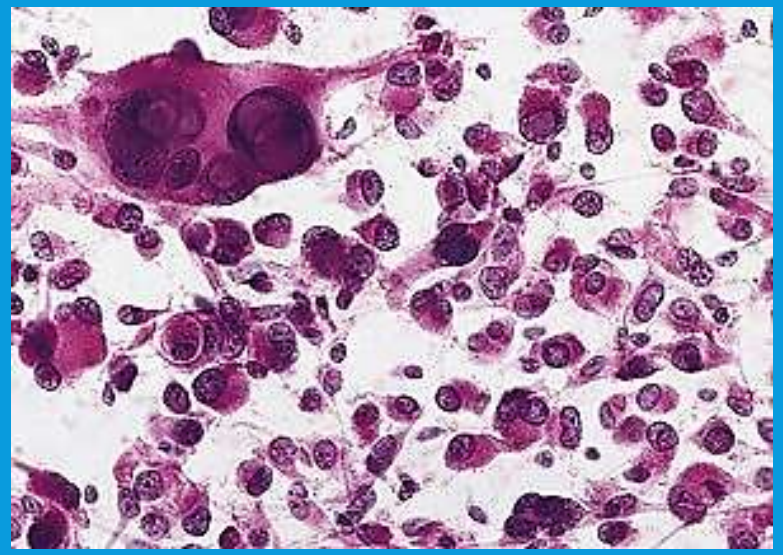


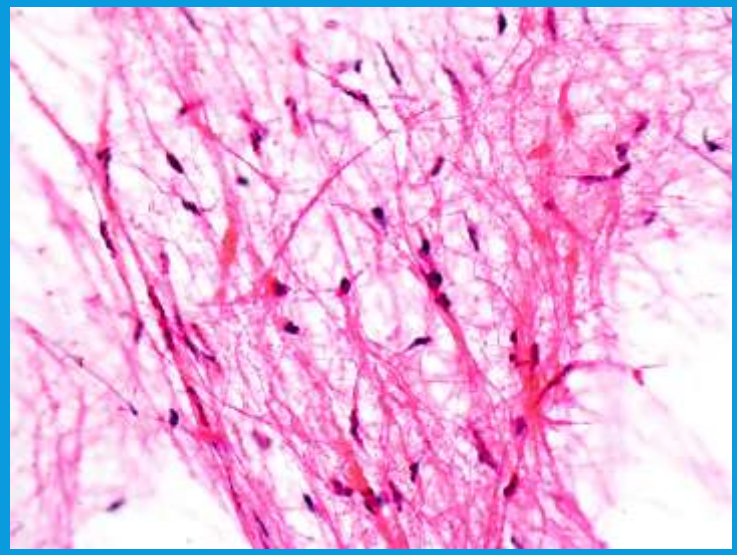
Touch imprint preparation



Squash or Crush preparation







Cytology of brain lesions on touch preparation

Take home message

- Most common clinical presentation for brain lesions are headache , vomiting , seizure , visual disturbance & altered mental status
- All the cases presented with headache are not always notorious, but it should be follow up carefully if needed
- Radiological examination is one of the most important diagnostic approachs , which not only evaluate the cases but also give a guidance for histopathologist regarding location & behaviour of lesions
- Beside routine histopathology ,special stains & immunohistochemistry are sometimes necessary to confirm the diagnosis


THANK YOU!