

# Brain and Spine Tumors

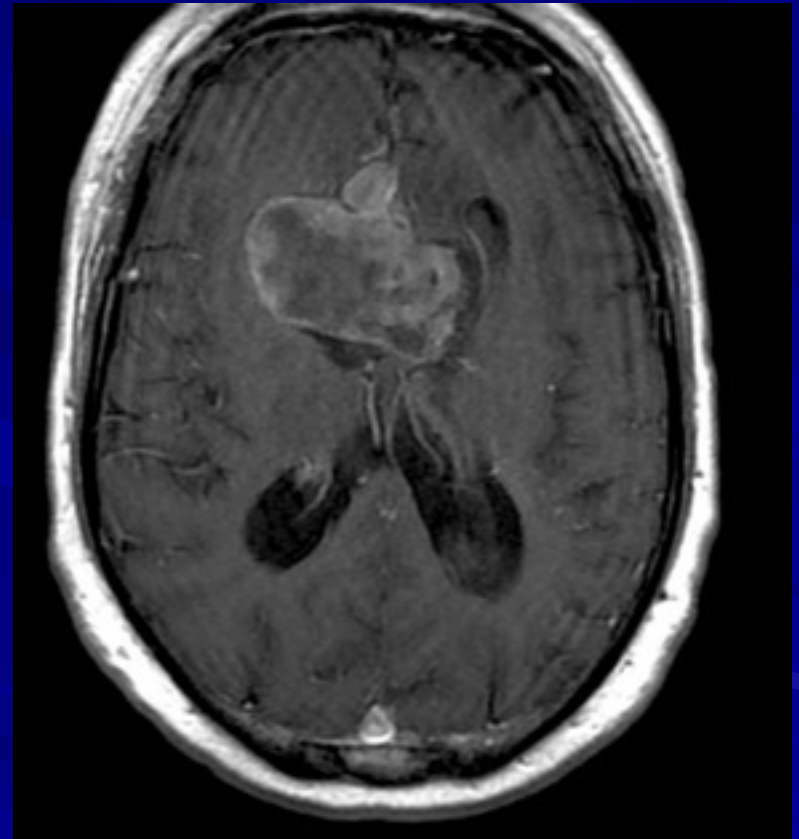
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SUNY at Buffalo School of Medicine



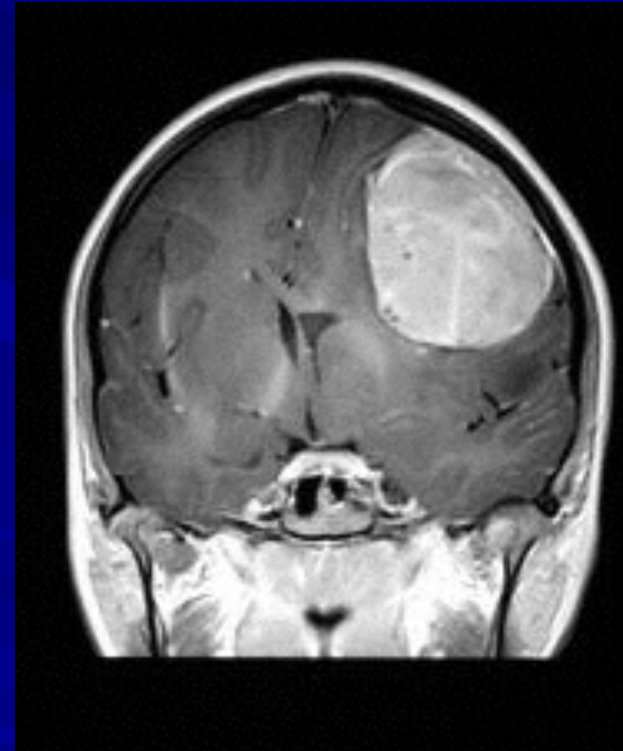
# Brain Tumors

- Brain Tumor Basics
- Types of Tumors
- Cases

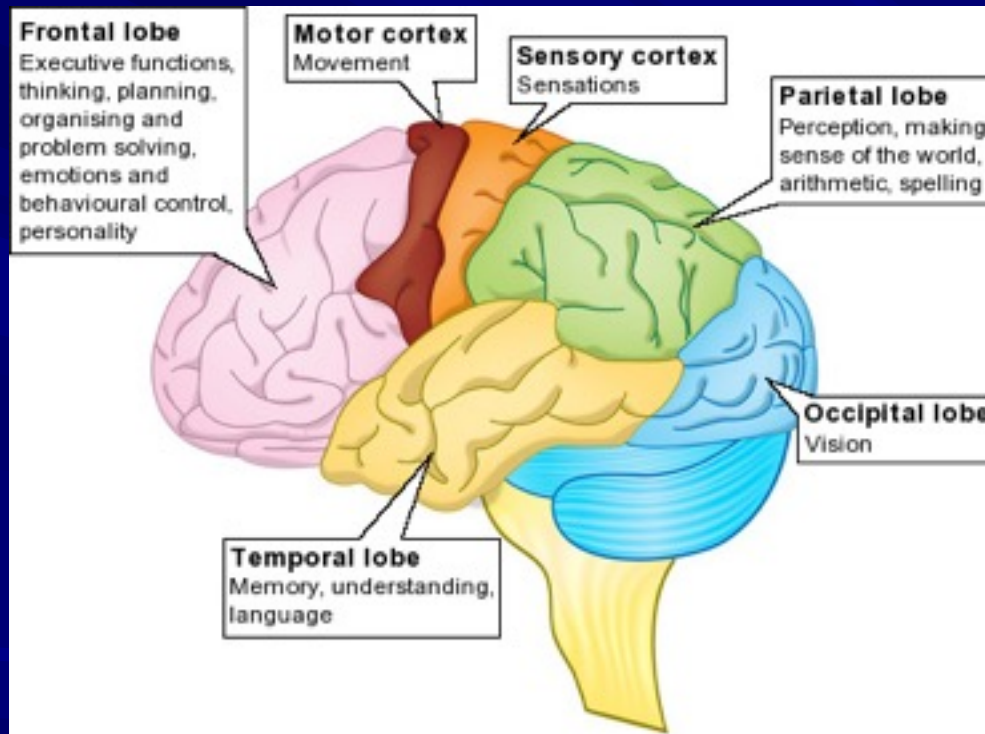


# Brain Tumors

- Skull is a fixed space
- Symptoms develop due to compression of normal brain

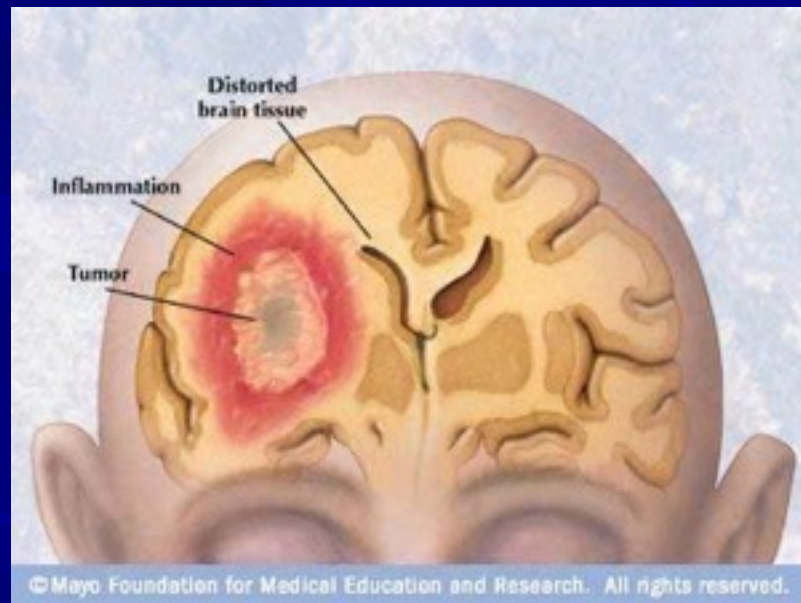


# Brain Tumors



# Brain Tumors

- Inflammation/Edema occurs in the surrounding normal brain

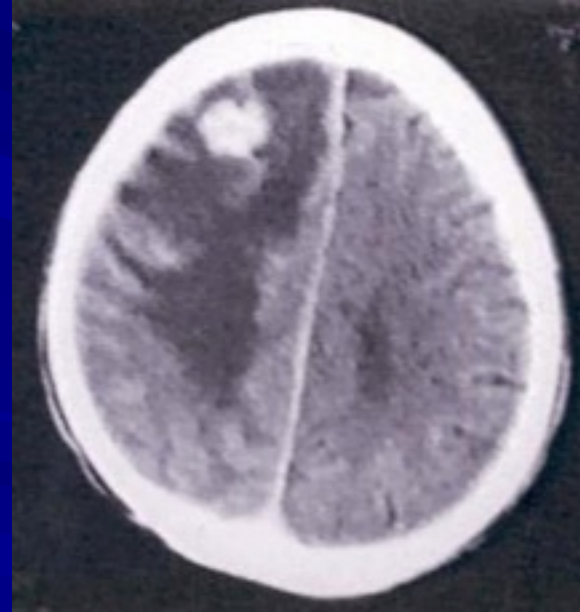


# Brain Tumors

- Tumors cause edema and irritation of normal brain
- Breakdown of BBB
- Corticosteroids for edema
- Anti-epileptics to prevent seizures

# Corticosteroids

- Dexamethasone traditionally used
- Reduces vasogenic edema
- GI prophylaxis



# Steroids

Multiple side effects:

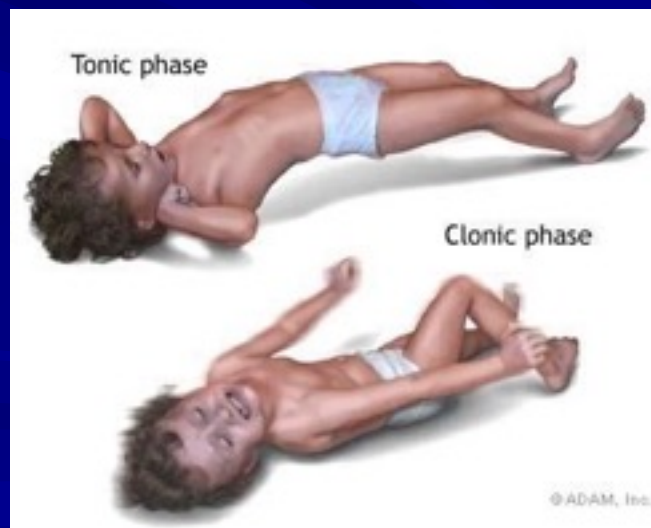
- Diabetes
- Myopathy
- Infection
- LE edema
- Weight gain
- Wound issues





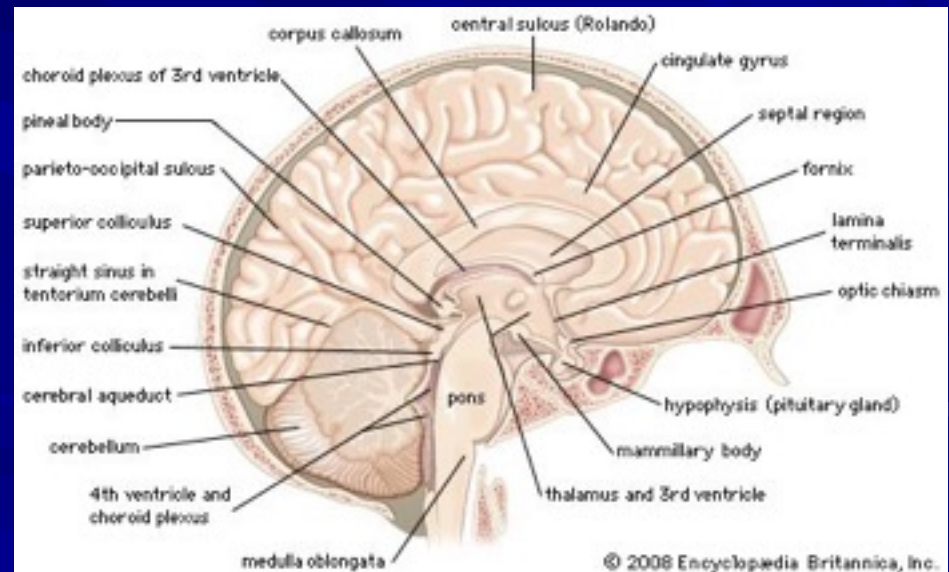
# Anti-Epileptic Drugs

- Used for cortical lesions
- Not required for cerebellar lesions
- Dilantin – requires monitoring
- Keppra



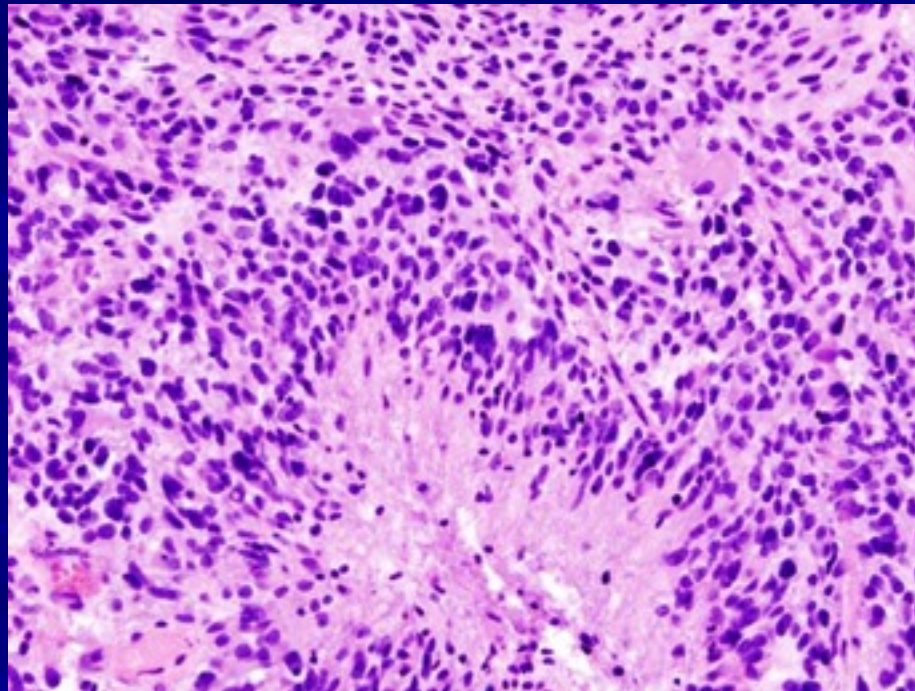
# Tumor Types

- Gliomas
- Meningiomas
- Metastatic Tumors
- Pituitary Tumors



# Gliomas

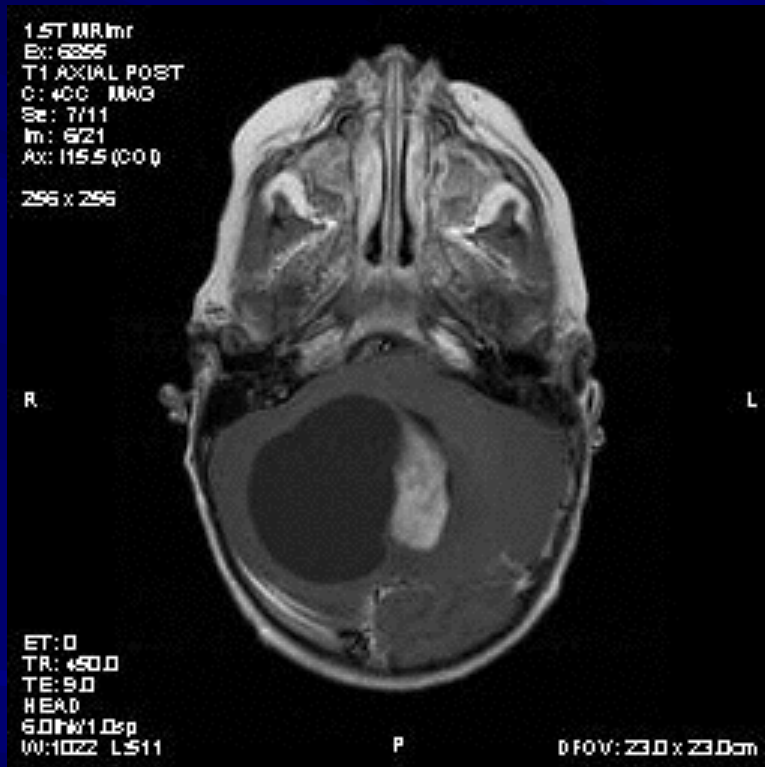
- Arise from native cells within the brain



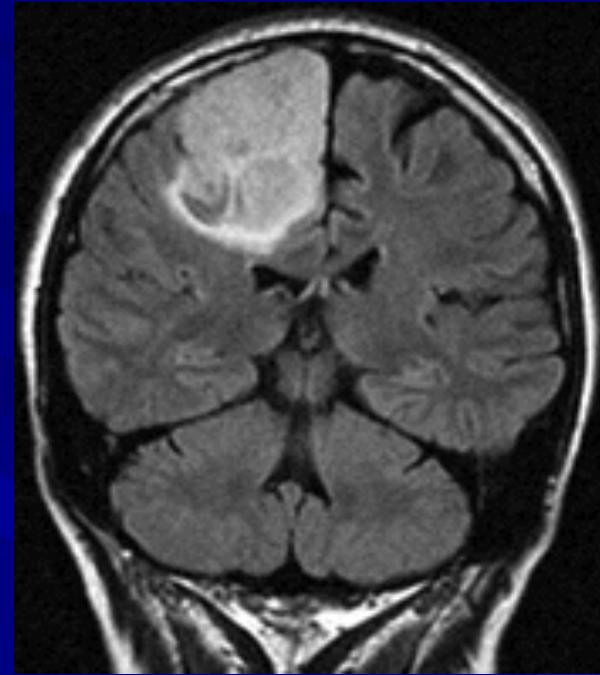
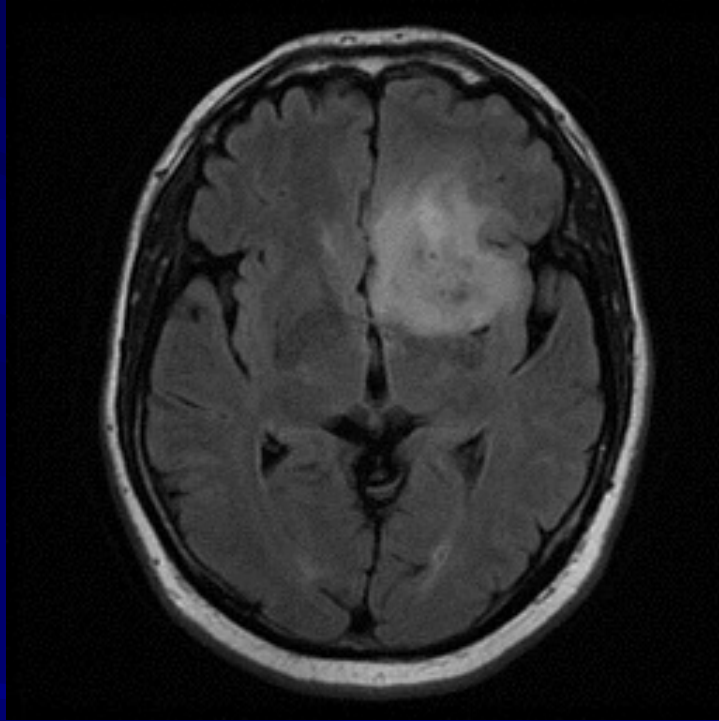
# Gliomas

- WHO I – Pilocytic Astrocytoma
- WHO II – Fibrillary Astrocytoma
- WHO III – Anaplastic Astrocytoma
- WHO IV – Glioblastoma Multiforme

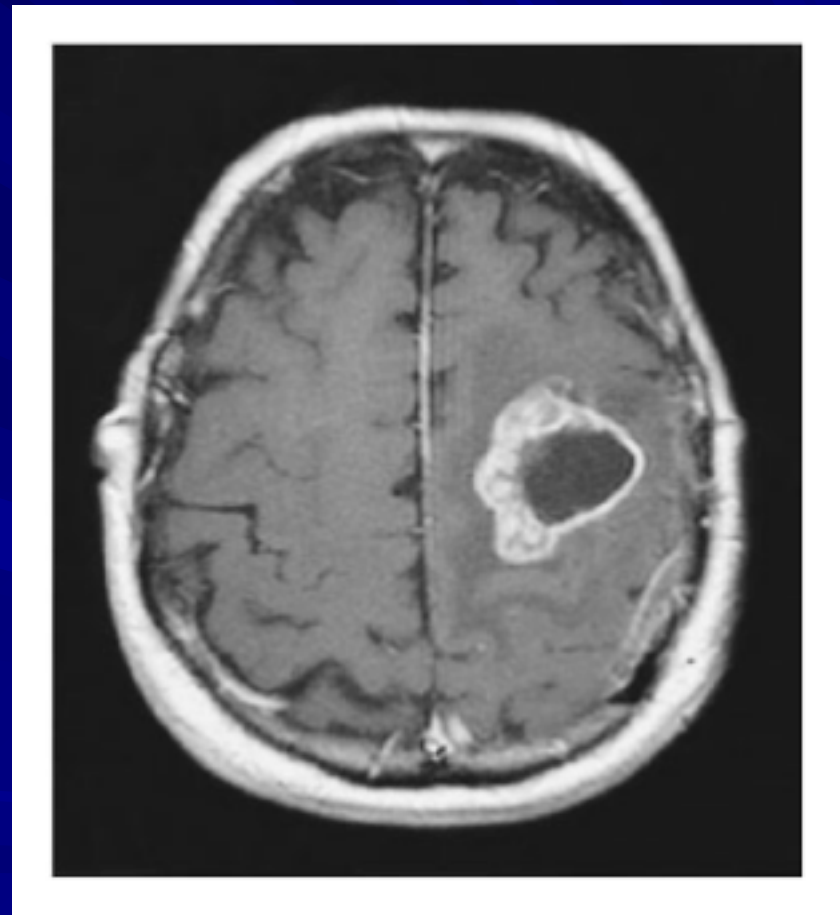
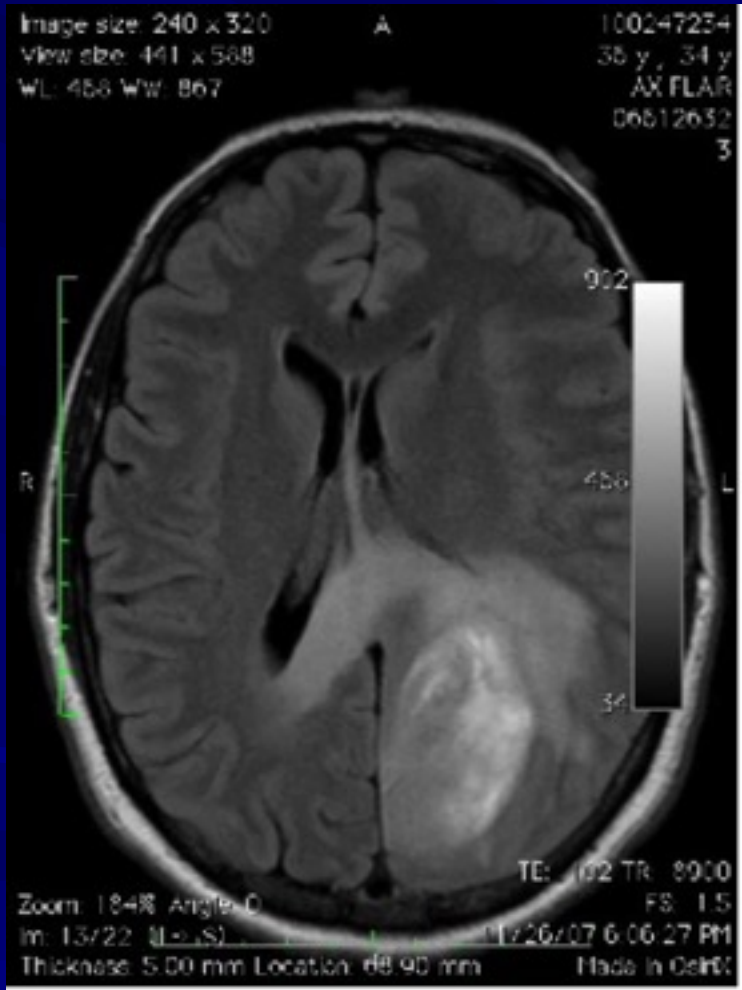
# Gliomas – WHO I



# Gliomas – WHO II & III



# WHO IV - GBM



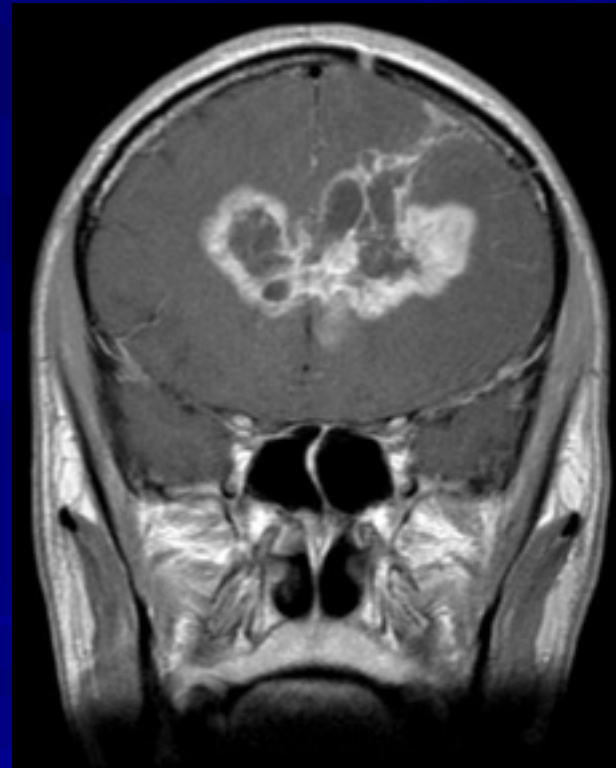
# Glioblastoma Multiforme

- Most common primary brain tumor in adults
- Incidence 3 per 100,000
- Average survival from diagnosis ~ 13 months
- Young age, High Karnofsky score associated with increased survival

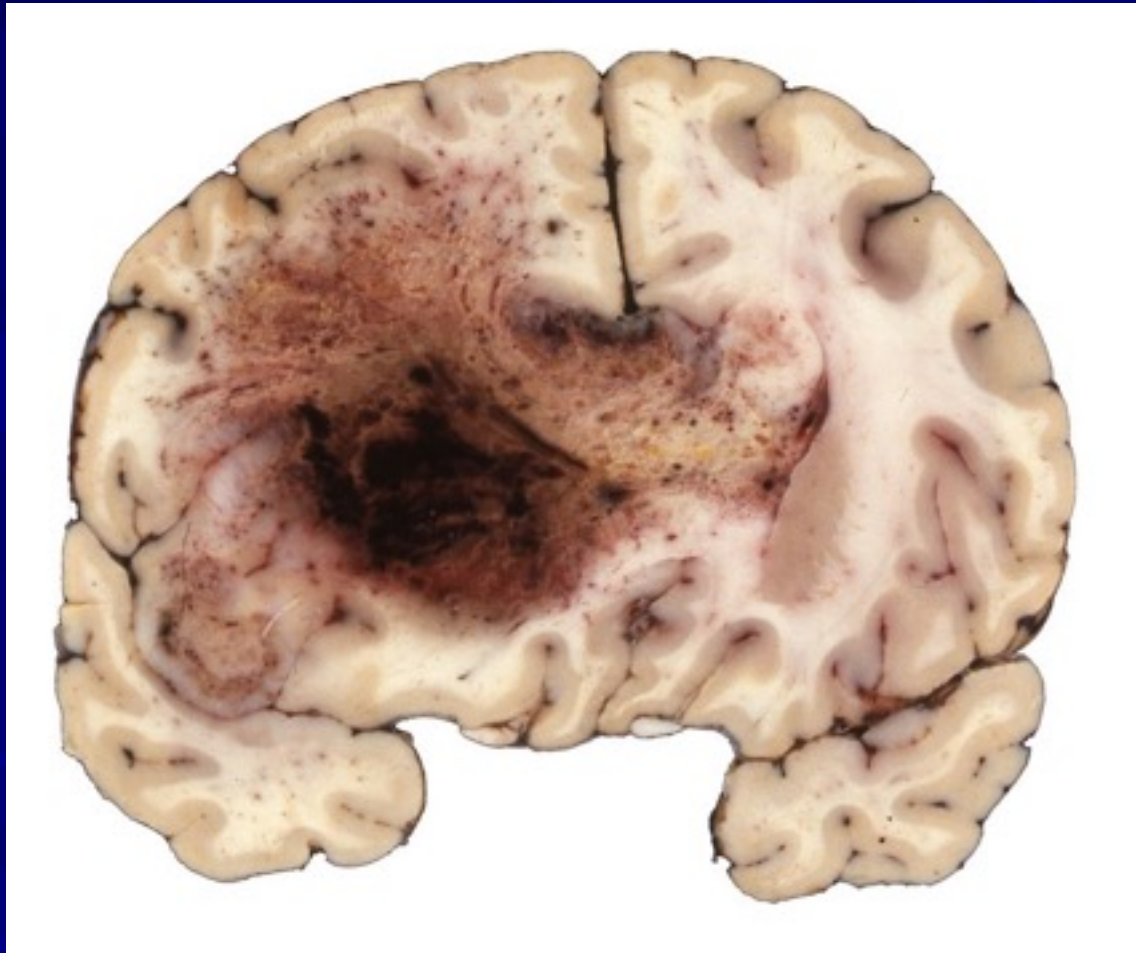


# Glioblastoma

■ Start steroids and anti-epileptics

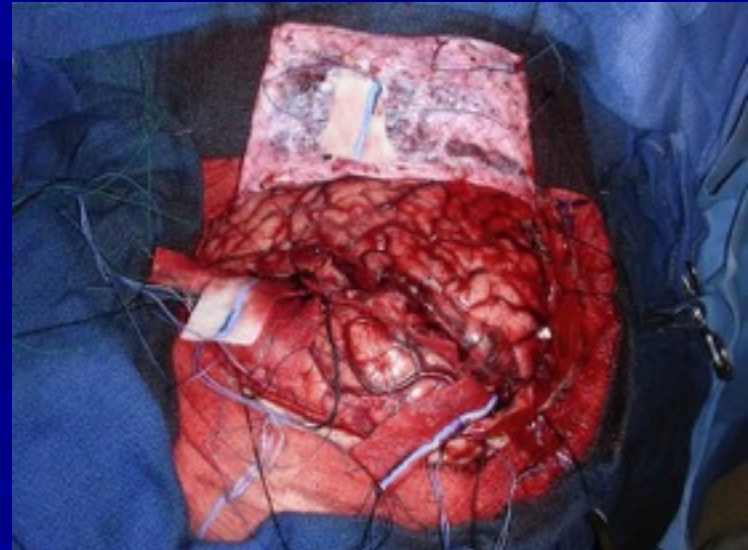


# Glioblastoma

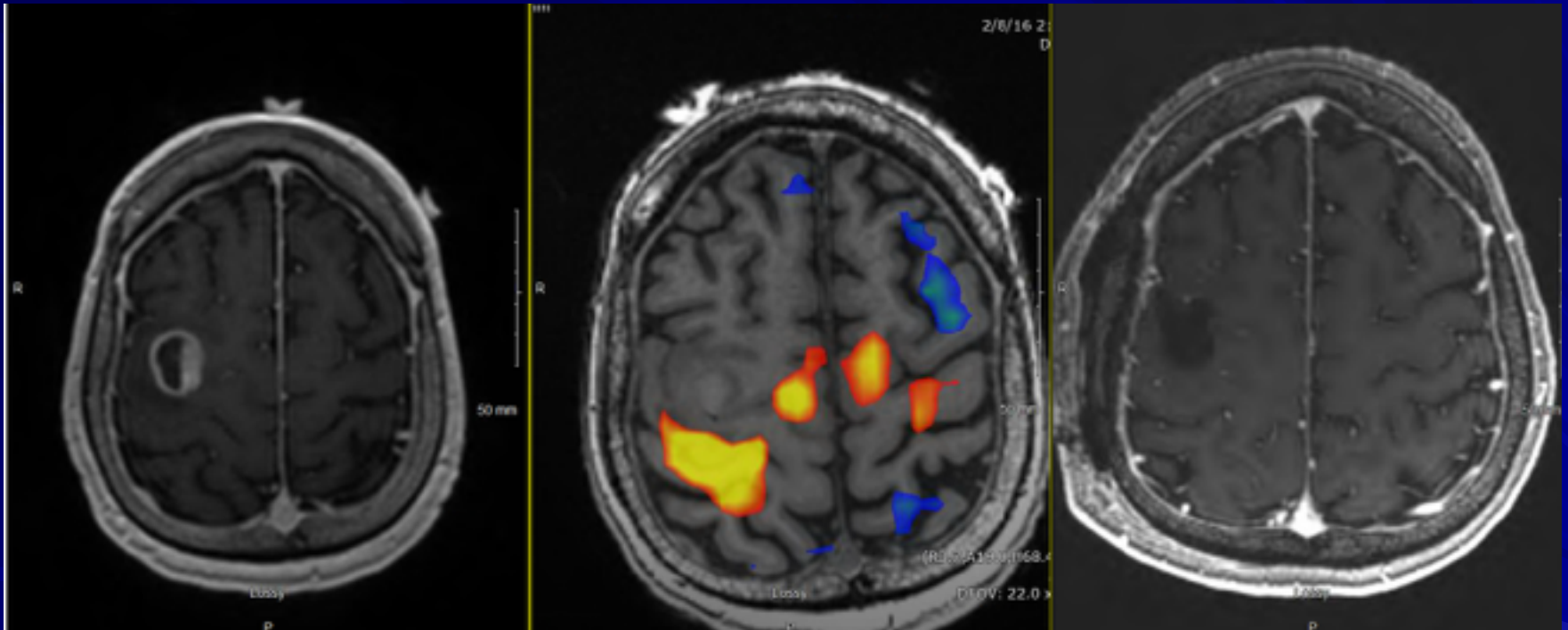


# Gliomas - Treatment

- Surgery
- Biopsy
- External Beam XRT
- Chemotherapy (Temodar)

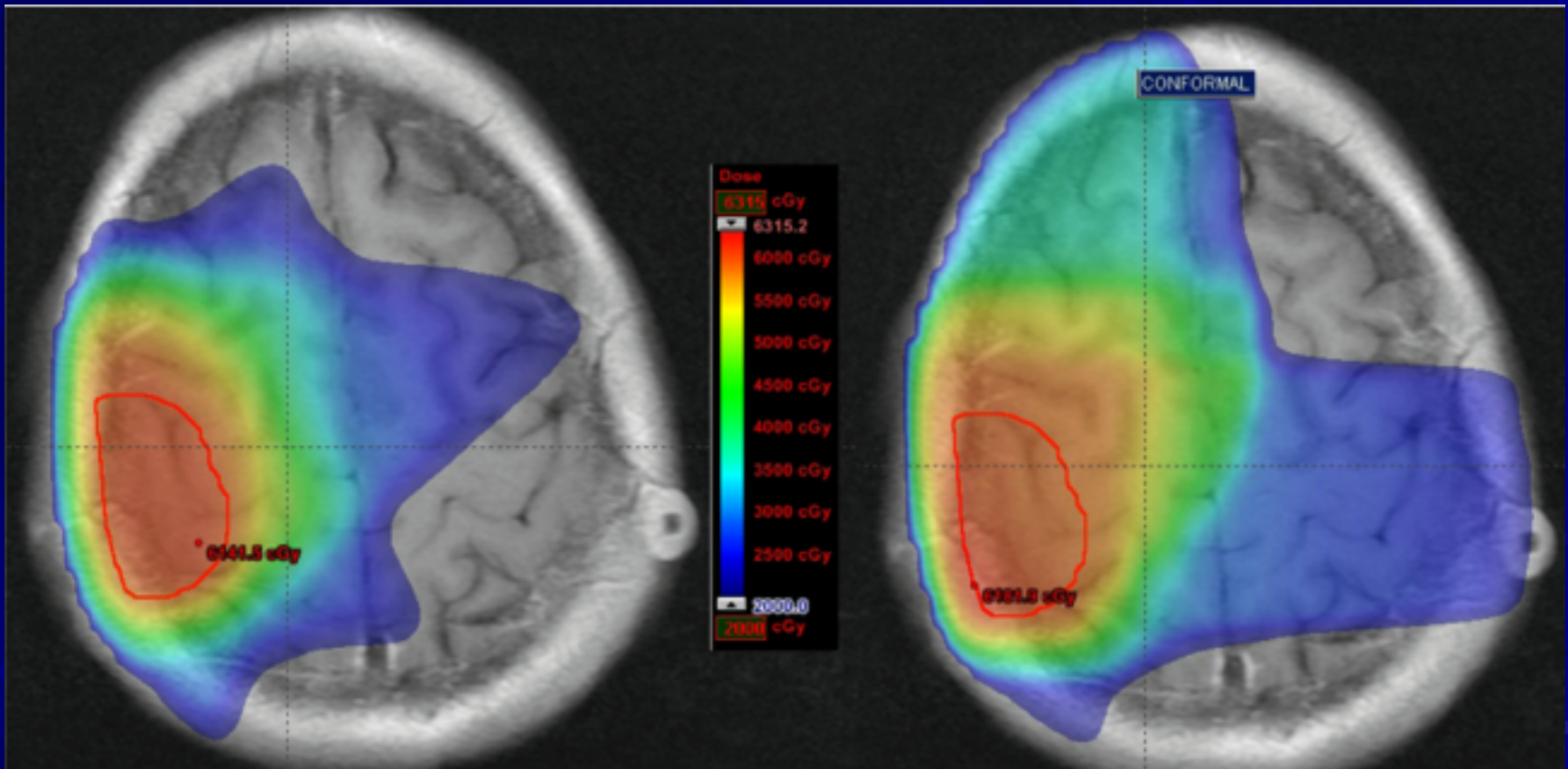


# Glioblastoma



Survival Related to Extent of Resection

# Glioblastoma



Typical IMRT course is Monday-Friday for 6 weeks.

# Glioblastoma – Standard Therapy

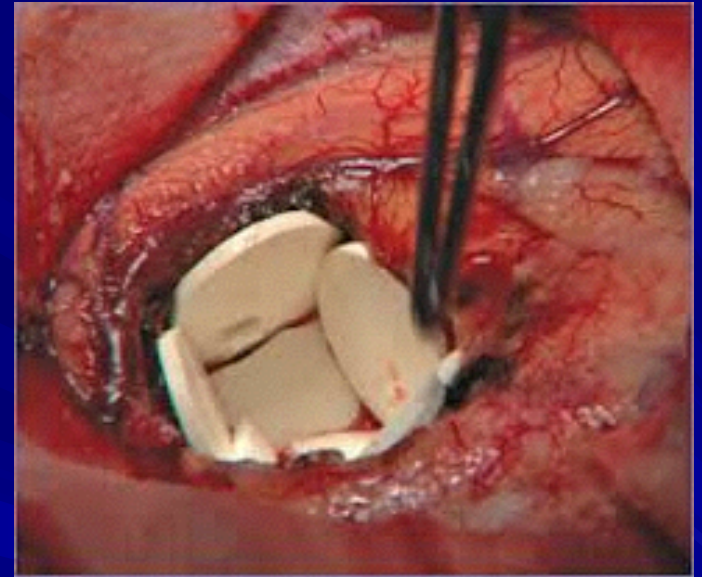
- Diagnosis
- Surgery if resectable
- RT and Oral Chemotherapy  
(Temazolamide)

# Glioblastoma

- Monitor for recurrence
- If recurrence, assess for possible re-resection
- May add additional chemotherapy

# GBM – Additional Therapies

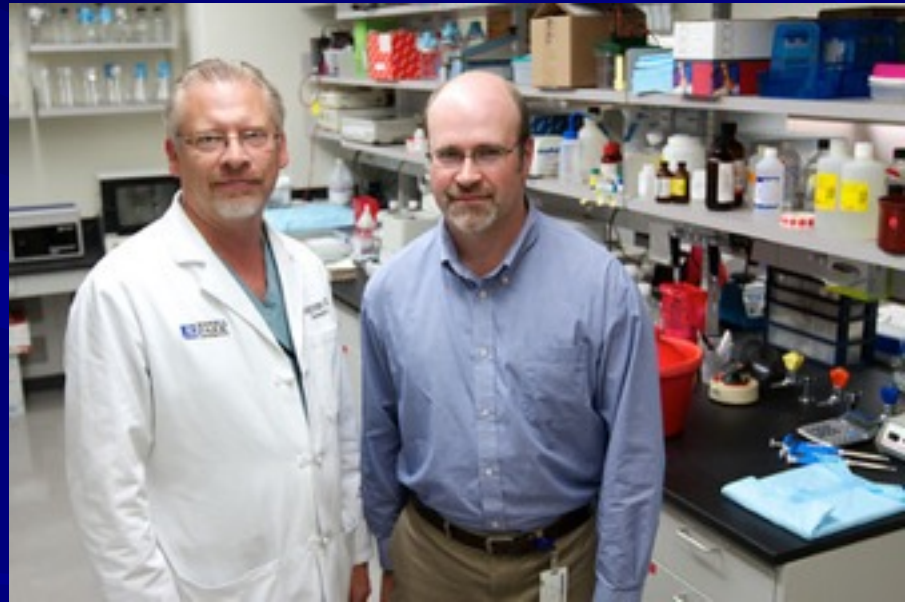
- Gliadel wafers can be inserted





# GBM – Additional Therapies

## ■ Vaccines



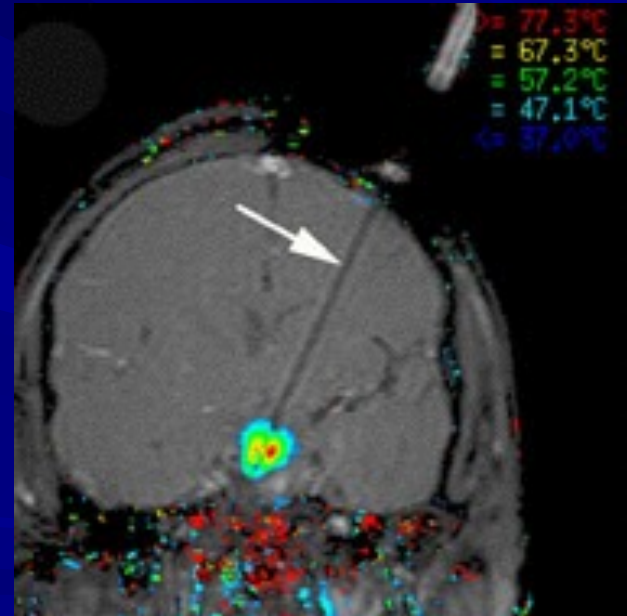
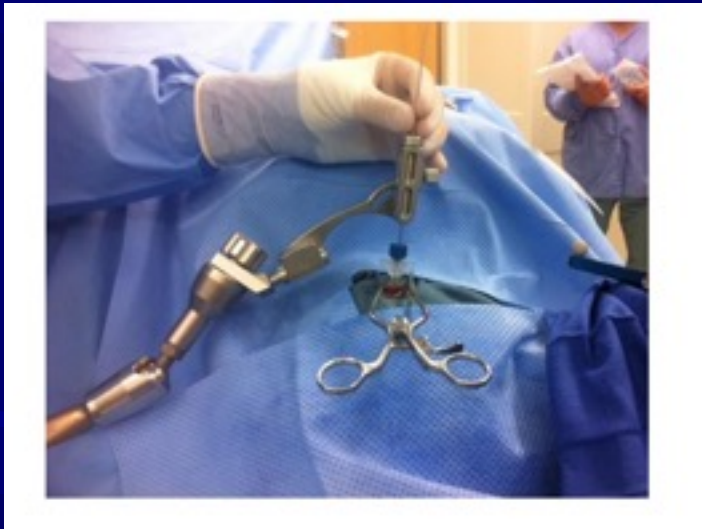
# GBM – Additional Therapies



Optune

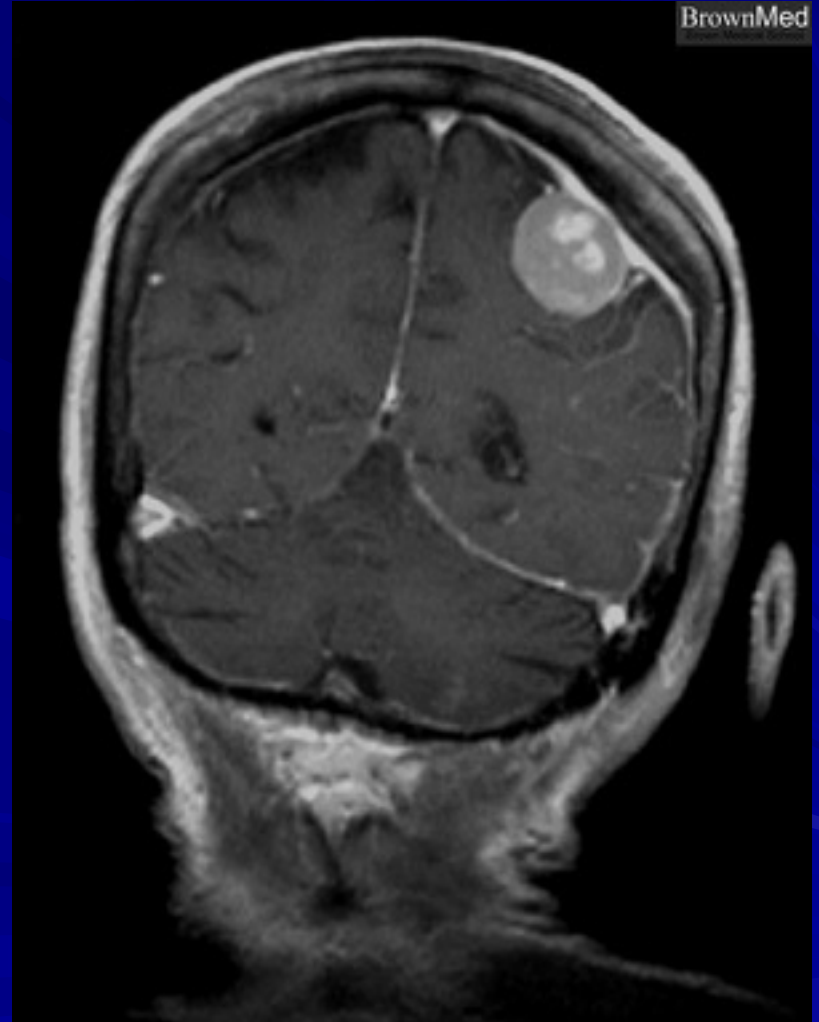
# GBM – Additional Therapies

## Laser-Interstitial Thermal Therapy (LITT)





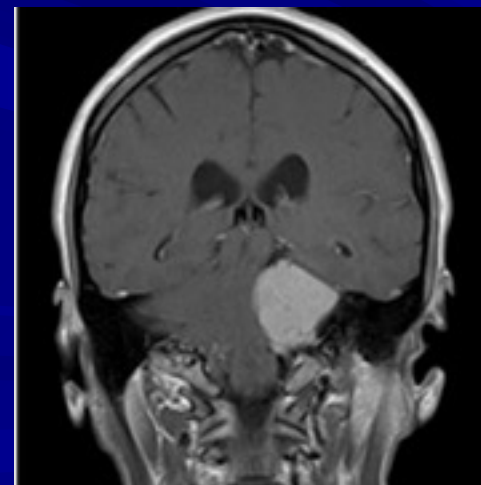
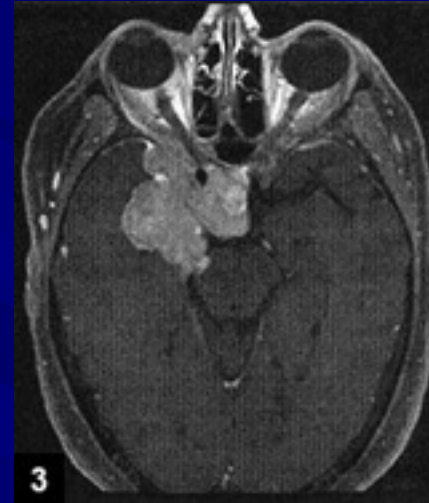
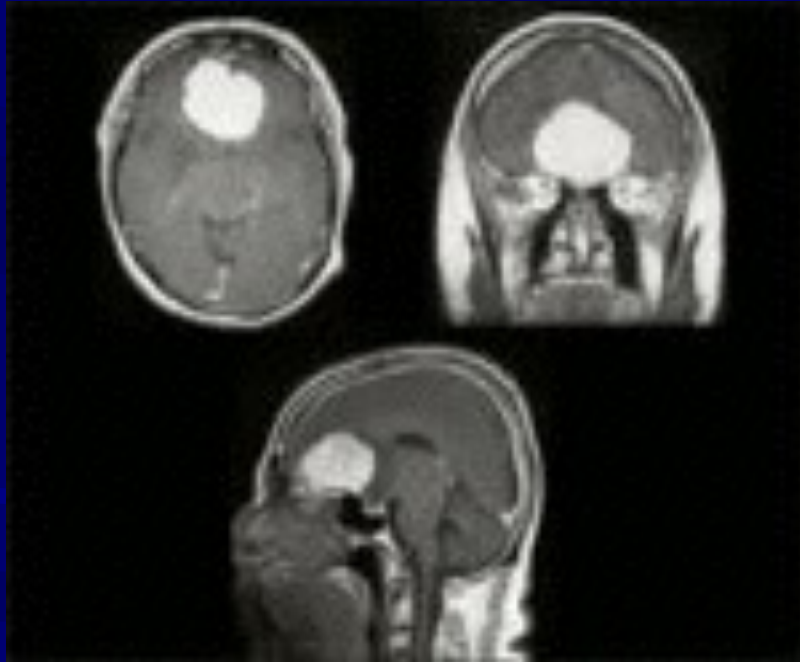
# Meningiomas



# Meningiomas

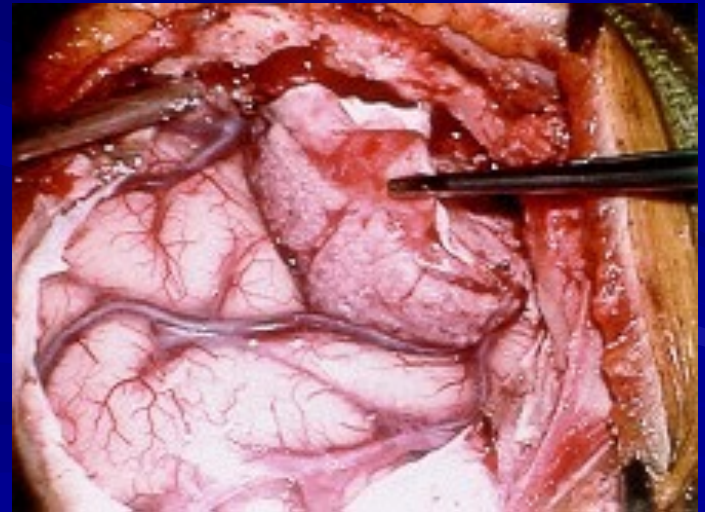
- Develop from arachnoid cap cells
- More common in females
- Most are WHO I
- WHO II, III, IV “malignant meningiomas”

# Meningiomas



# Meningiomas - Treatment

- Anti-epileptics, steroids in some instances
- Observation
- Gamma Knife (<3 cm)
- Open Surgery

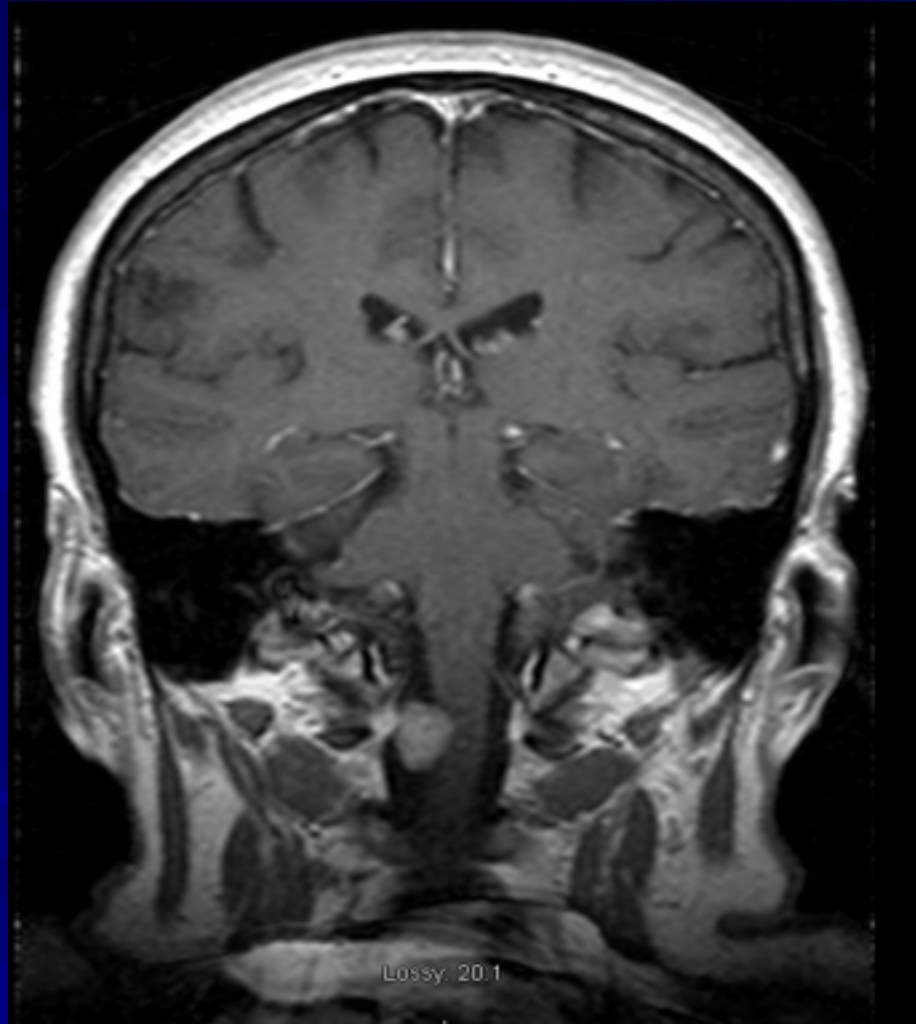




# Meningiomas

- 62 yo female presented with gait instability
- On PE, had an ataxic gait and lower extremity hyperreflexia

# Meningiomas





# Meningiomas

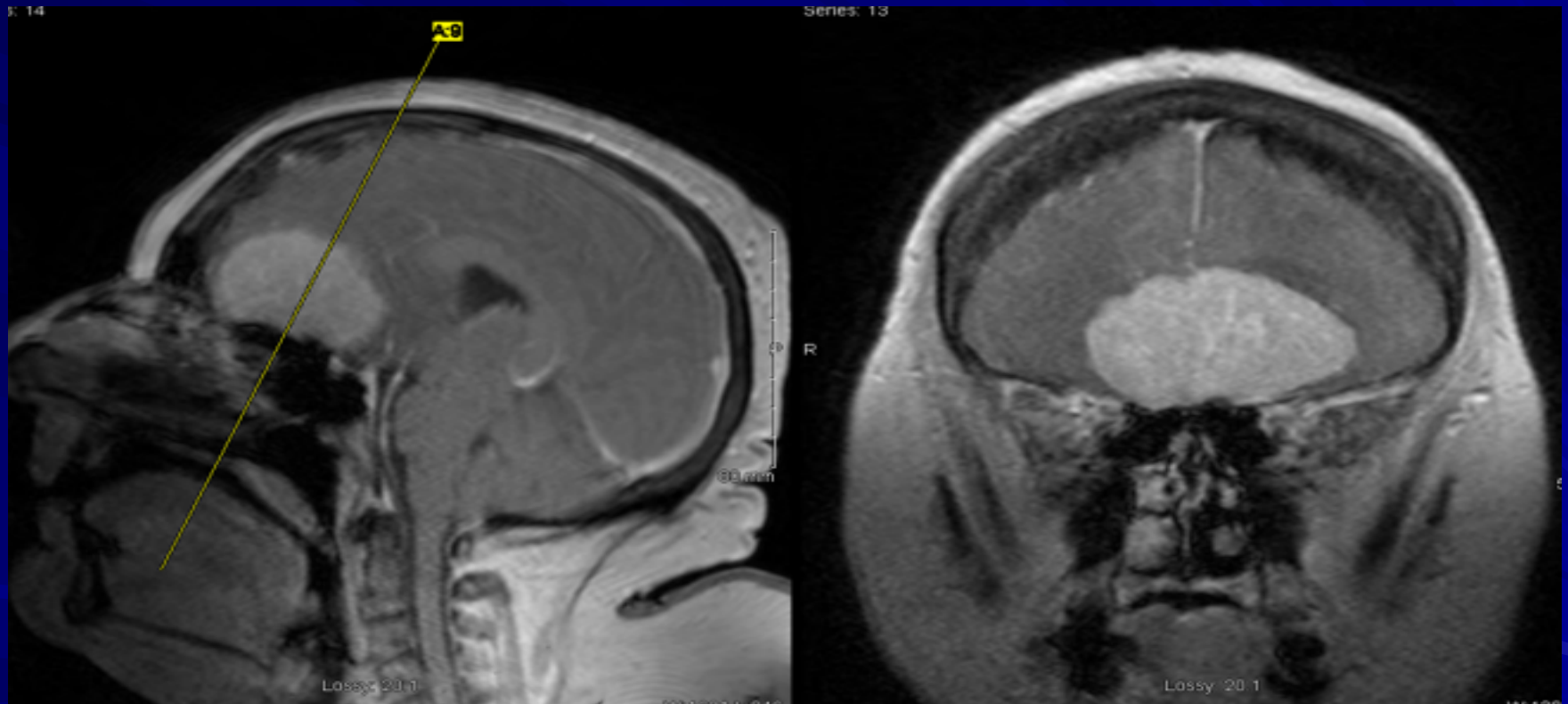
- 60 yo female presents with change of personality
- Over the past 6 months – 1 year, patient has been confused and has poor short-term memory
- Always pleasant, which is unusual
- Diagnosed with “Depression with psychotic features”

# Meningiomas

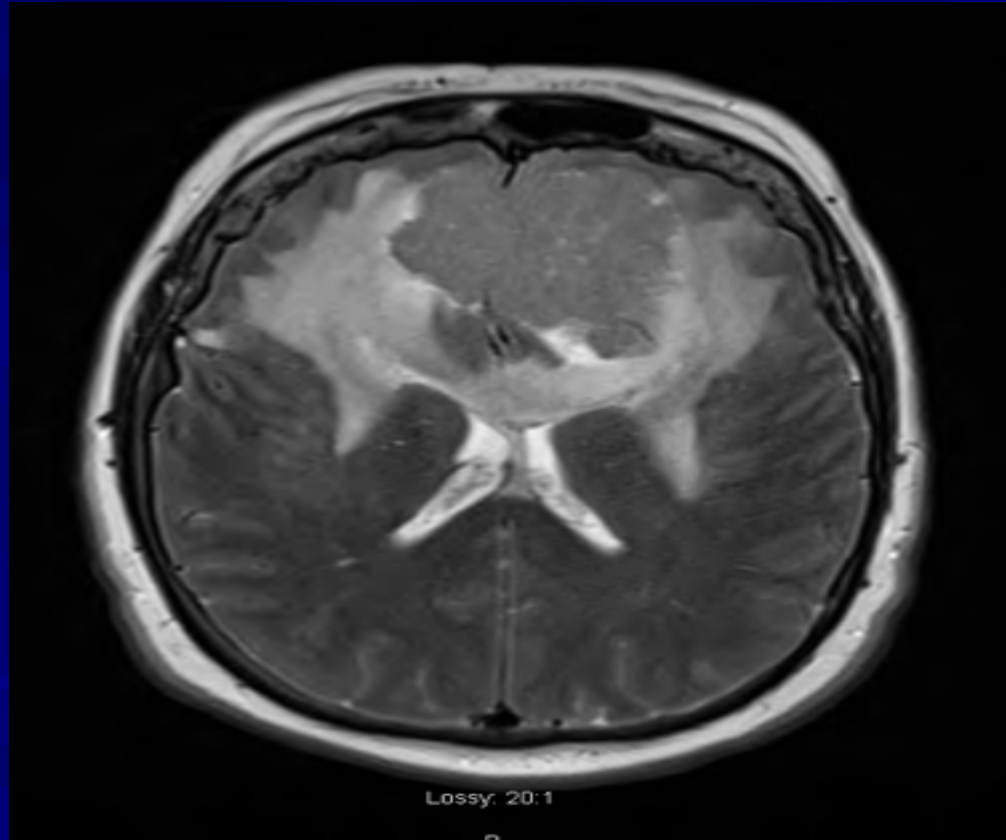
Exam:

- Awake and pleasant
- Obese
- Confused, poor recall
- No sense of smell
- Some difficulty moving legs

# Meningiomas



# Meningiomas



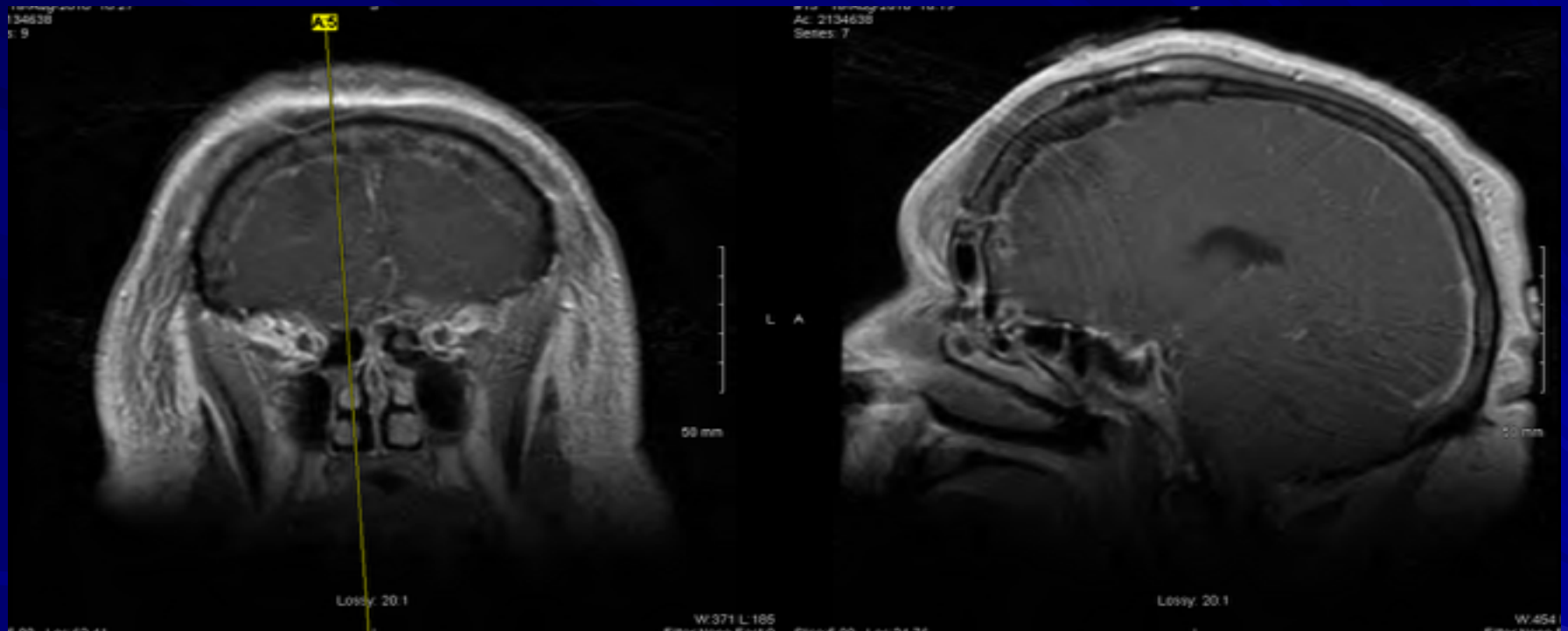
# Meningiomas

- Patient started on steroids and anti-epileptics
- Underwent bifrontal craniotomy for tumor removal





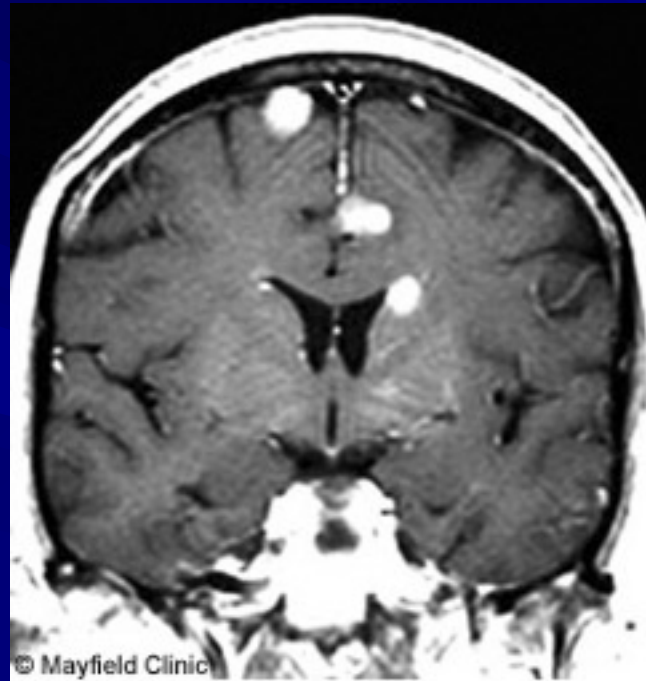
# Meningiomas



# Meningiomas

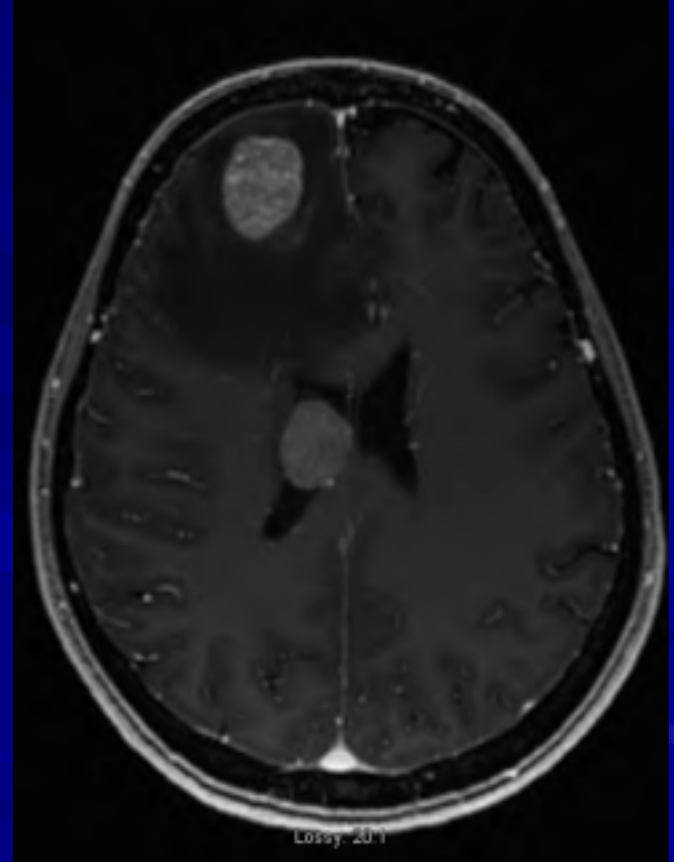
- Patient has had slow recovery over 6 months
- Edema slowly resolving
- Now doing crosswords, but still a short-term memory deficit

# Metastatic Tumors



# Metastatic Tumors

- Single lesion < 3 cm –  
Gamma Knife
- Single lesion > 3 cm –  
Open Surgery
- Multiple lesions:  
Gamma Knife vs. XRT



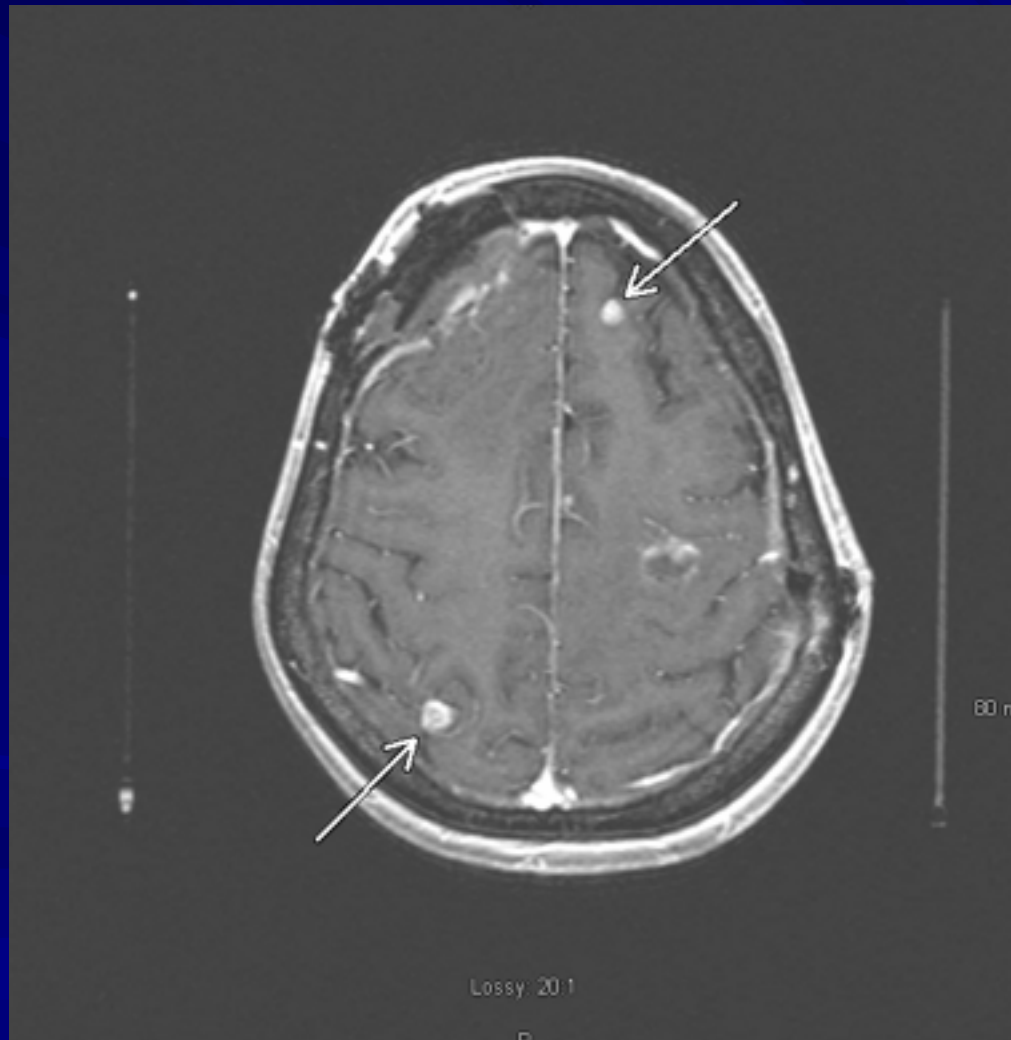
# Gamma Knife Radiosurgery



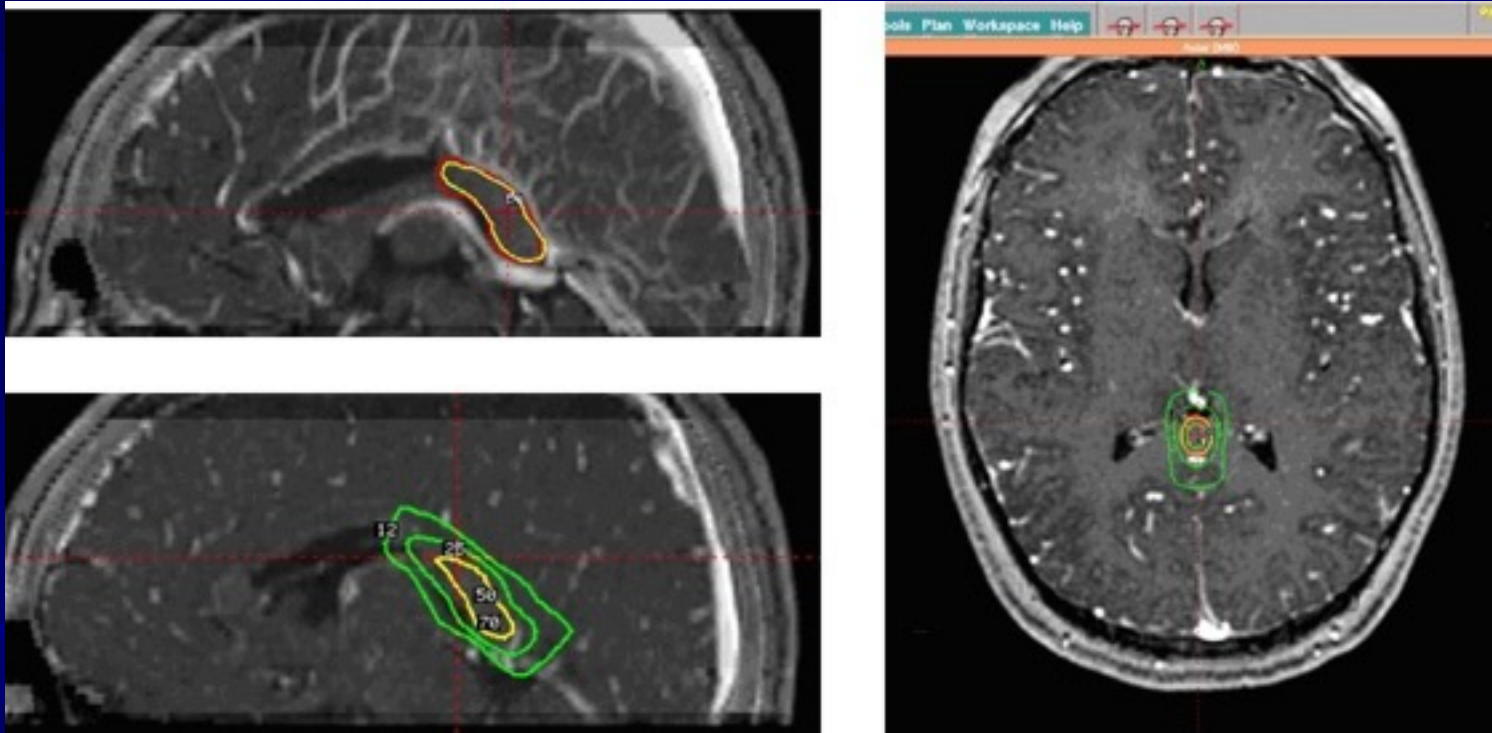
# Gamma Knife Radiosurgery



# Gamma Knife Radiosurgery



# Gamma Knife Radiosurgery



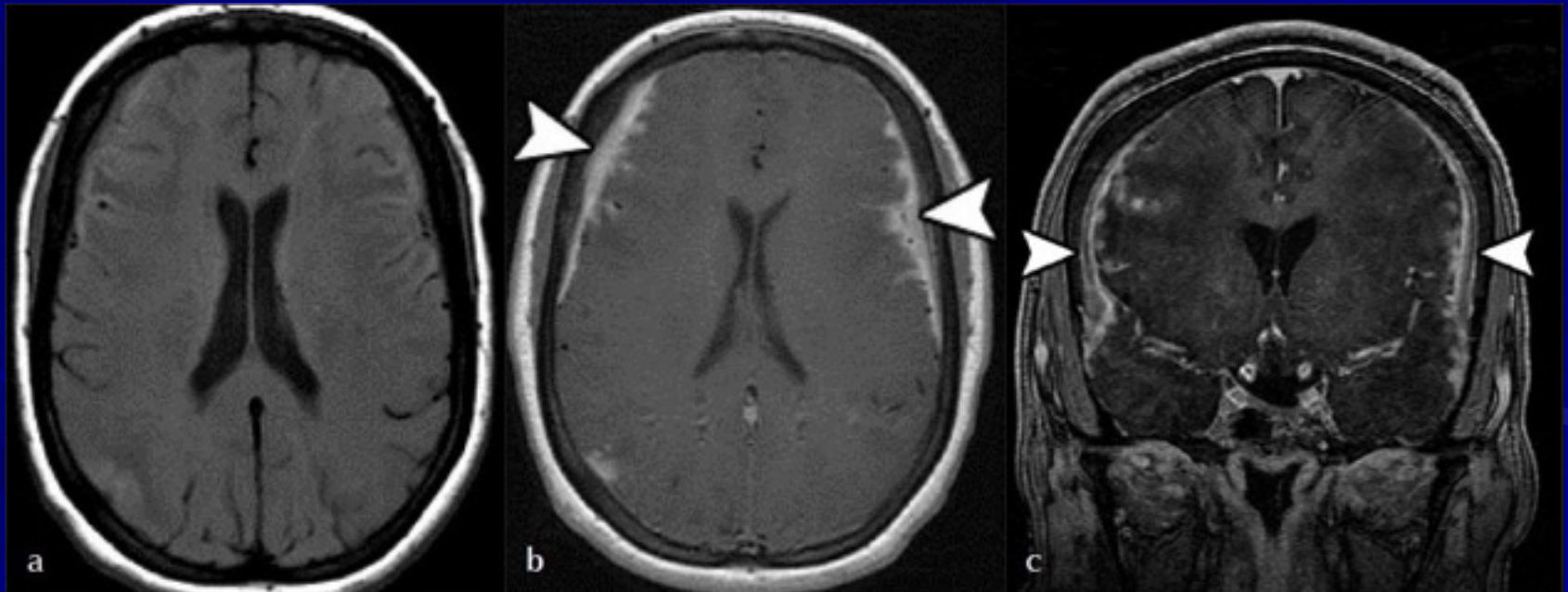


# Gamma Knife Radiosurgery



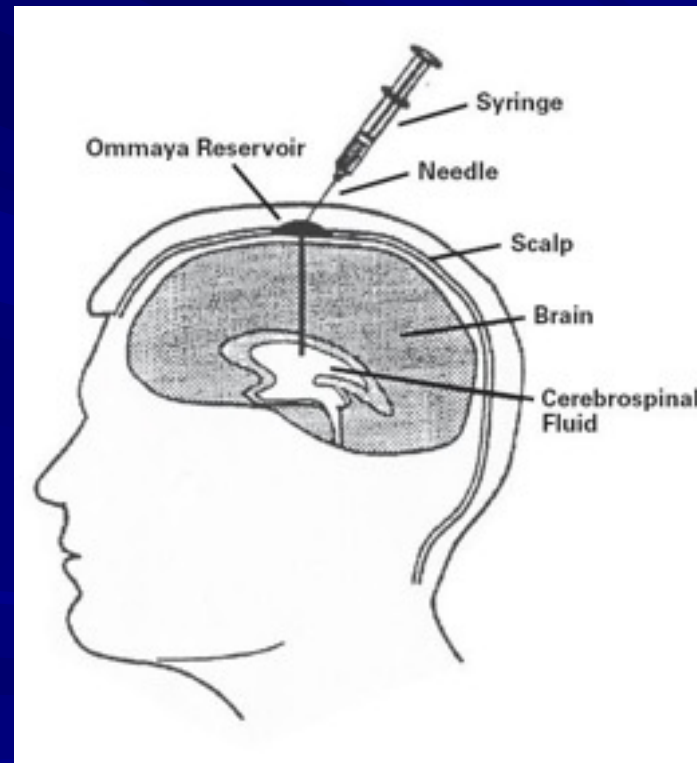
# Leptomeningeal Disease

- Poor prognosis
- Patients may develop cranial nerve palsies

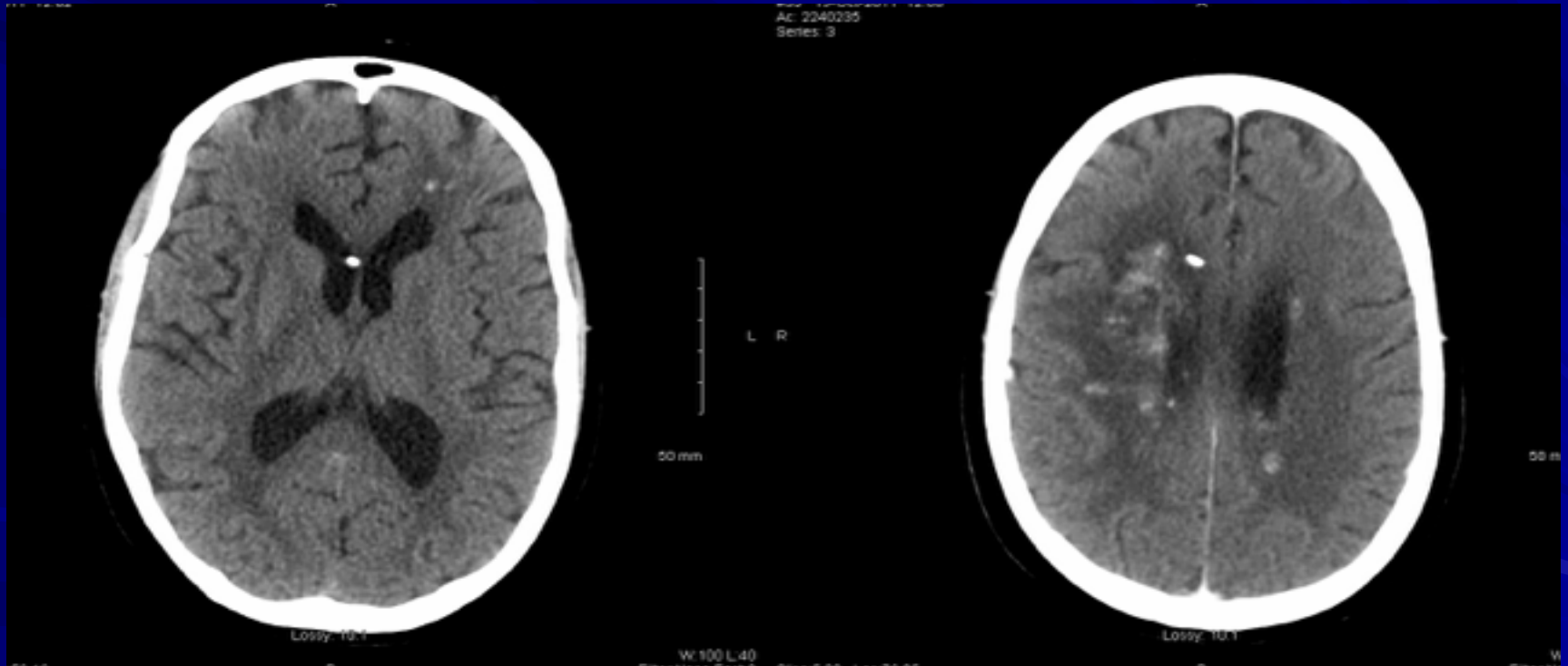


# Leptomeningeal Disease

## ■ Intrathecal chemotherapy



# Leptomeningeal Disease



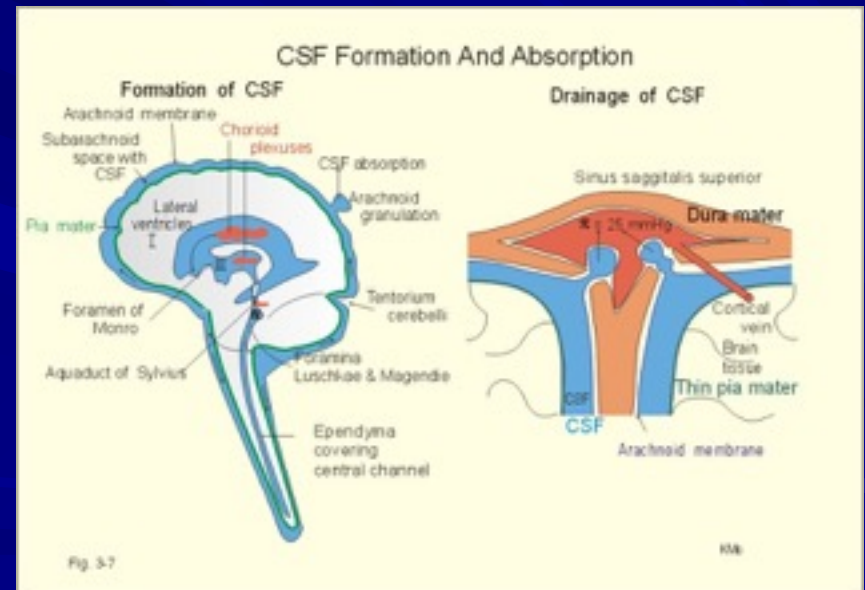
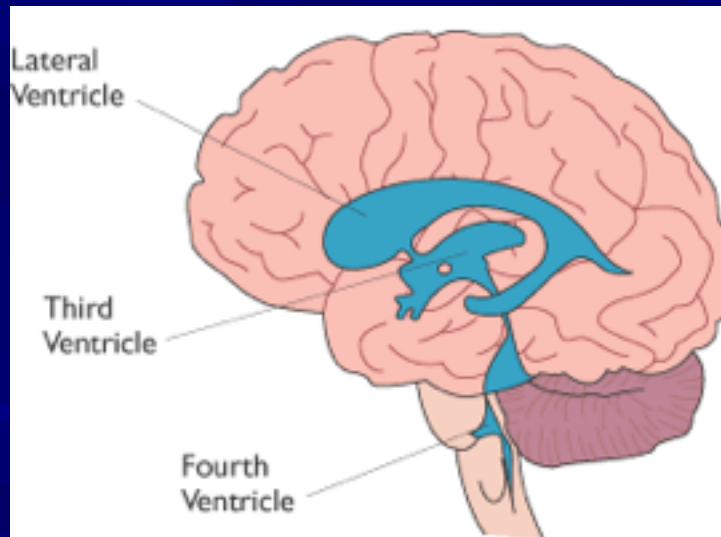
# Leptomeningeal Disease



Ref: [http://marksmelon.blogspot.com/2008\\_11\\_30\\_archive.html](http://marksmelon.blogspot.com/2008_11_30_archive.html)

# Hydrocephalus

- Cerebrospinal fluid build-up resulting in an increased intracranial pressure



# Hydrocephalus

- Patients develop symptoms from increased intracranial pressure
- Headaches, N/V, confusion, lethargy, coma

# Hydrocephalus

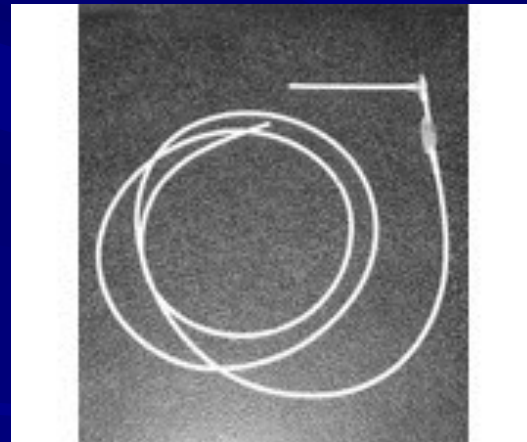
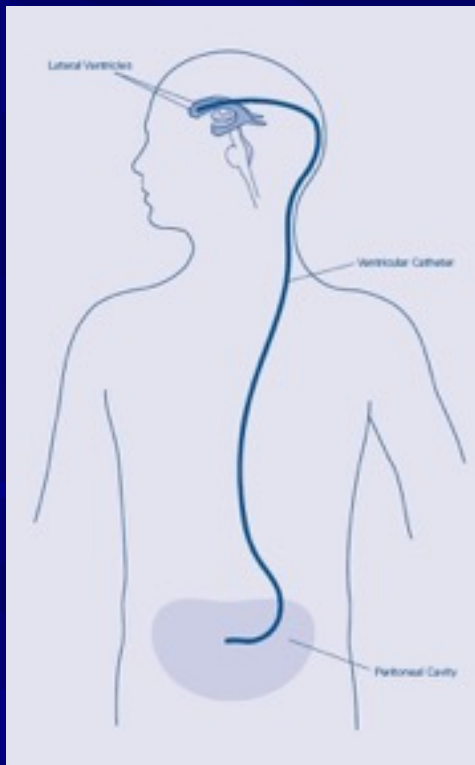
- Can be communicating or obstructive





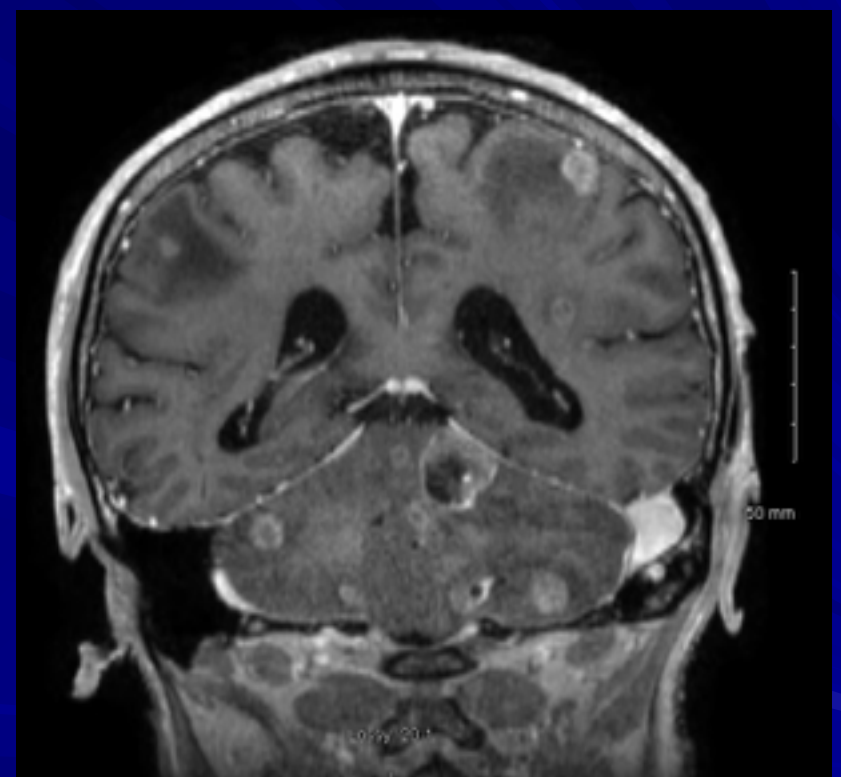
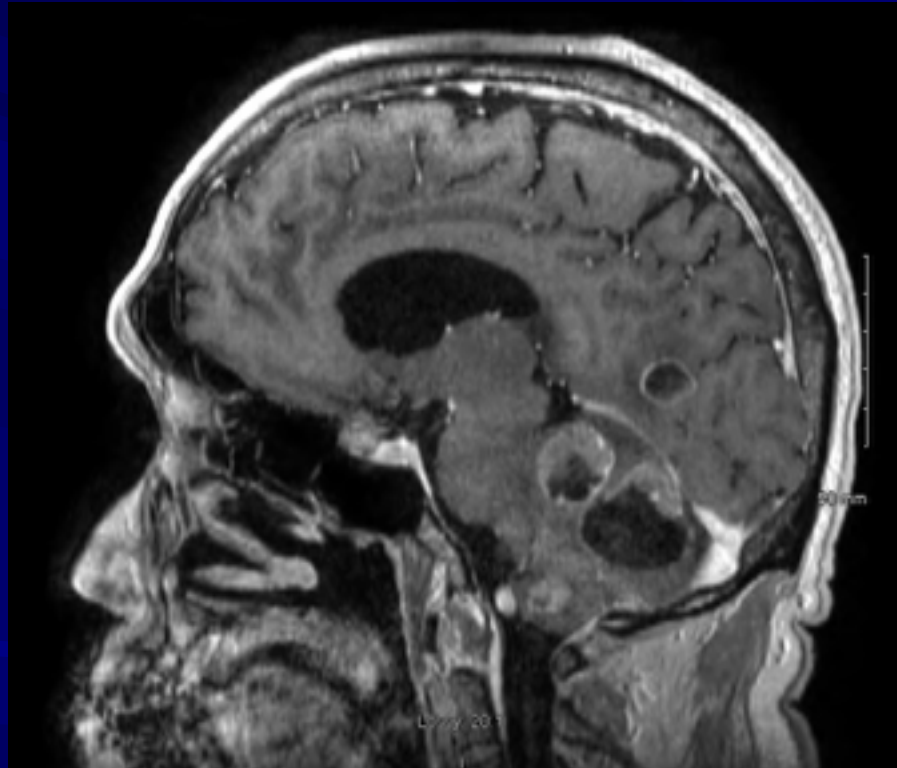
# Hydrocephalus

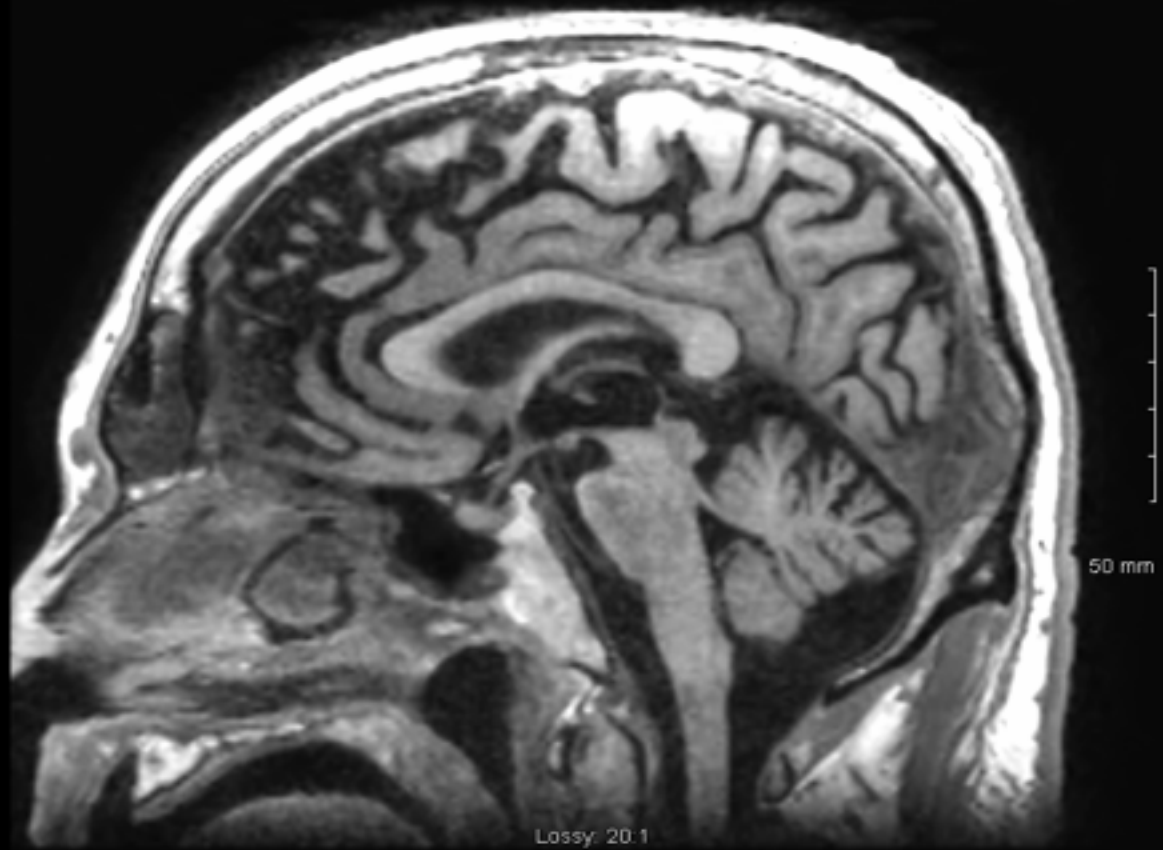
- Treatments include VP Shunt and Endoscopic Third Ventriculostomy (ETV)



# Hydrocephalus

- 58 yo man with a history of colon cancer with worsening headaches and confusion
- Patient had just completed external beam radiation tx for multiple brain metastases
- On PE he was confused and sleepy

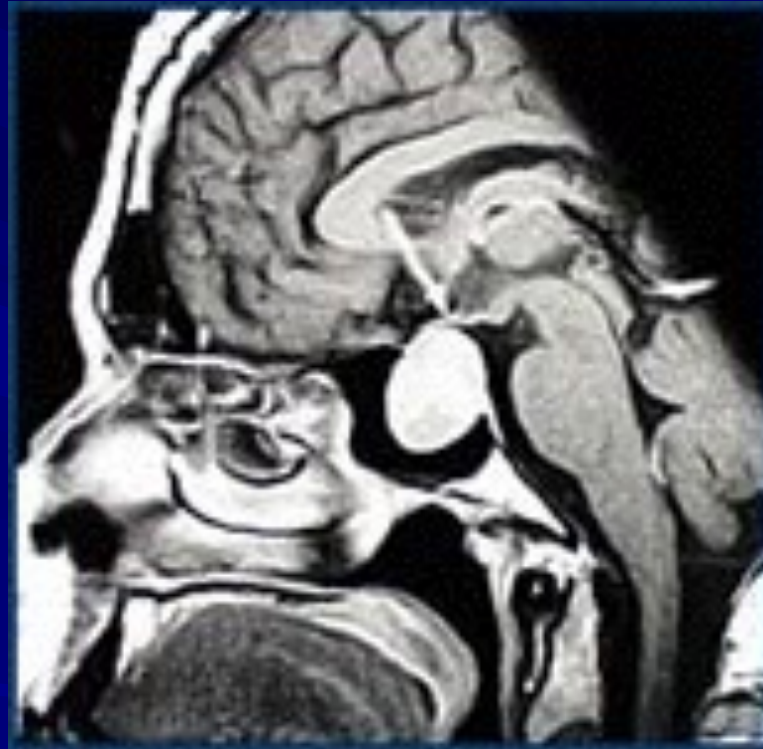




# ETV

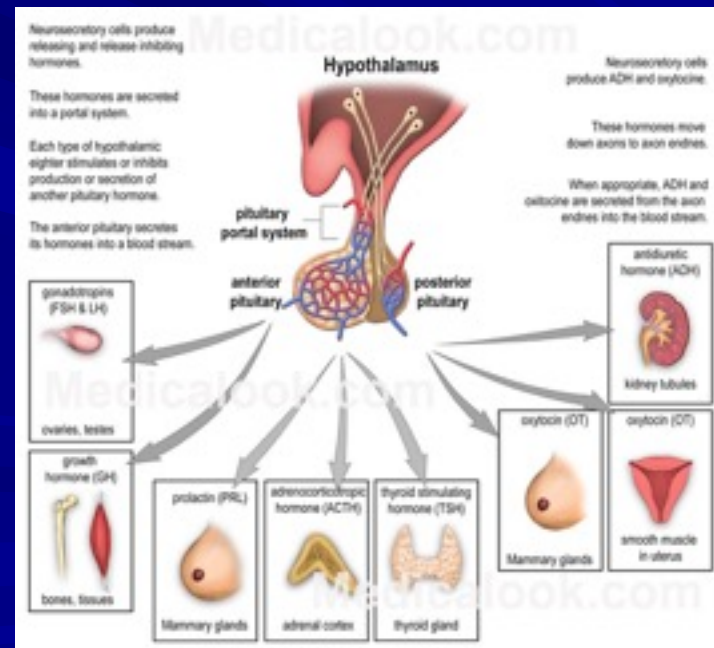
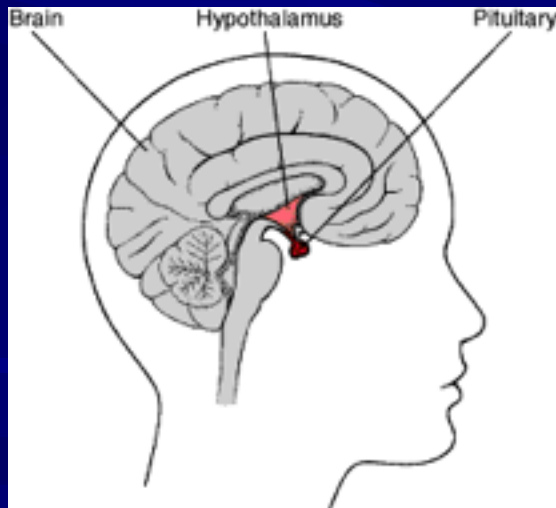


# Pituitary Tumors



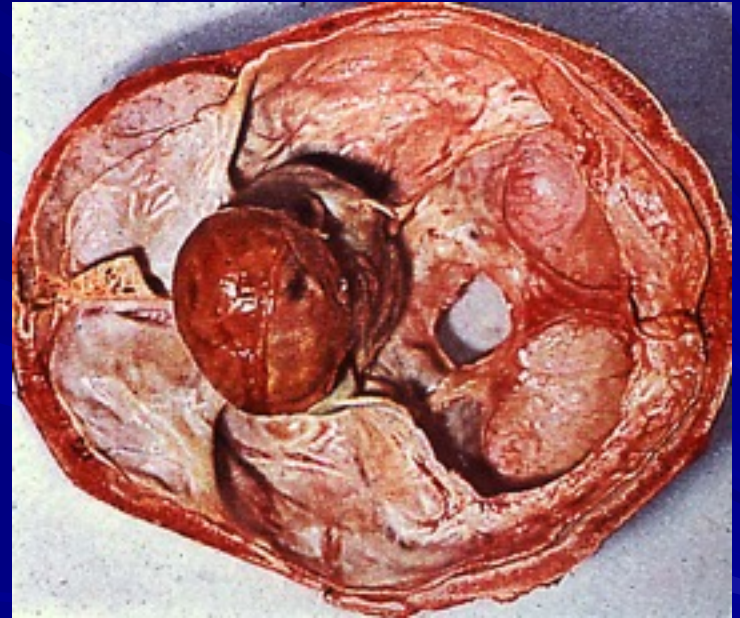
# Pituitary Tumors

- Pituitary gland is a marble-sized gland at the base of the brain that controls hormone regulation in the body



# Pituitary Tumors

- Most common Pituitary Adenomas (non-secreting)
- Cushing's Disease
- Acromegaly
- Prolactinomas



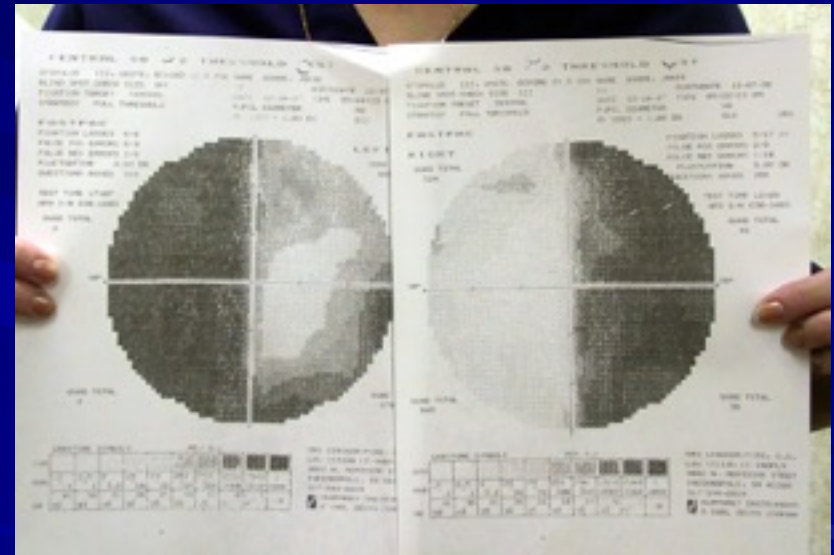


# Pituitary Adenoma

- Benign Tumor
- Seen in ~5% of “normal population”
- Microadenoma < 1 cm
- Macroadenoma > 1 cm
- Treat with observation

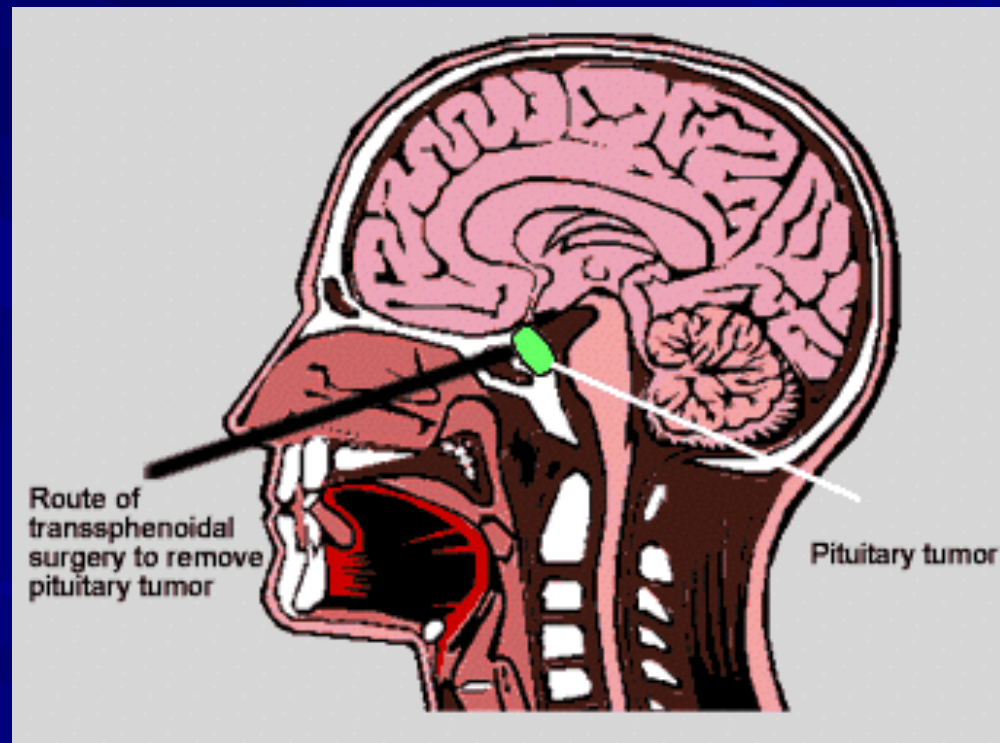
# Pituitary Adenoma

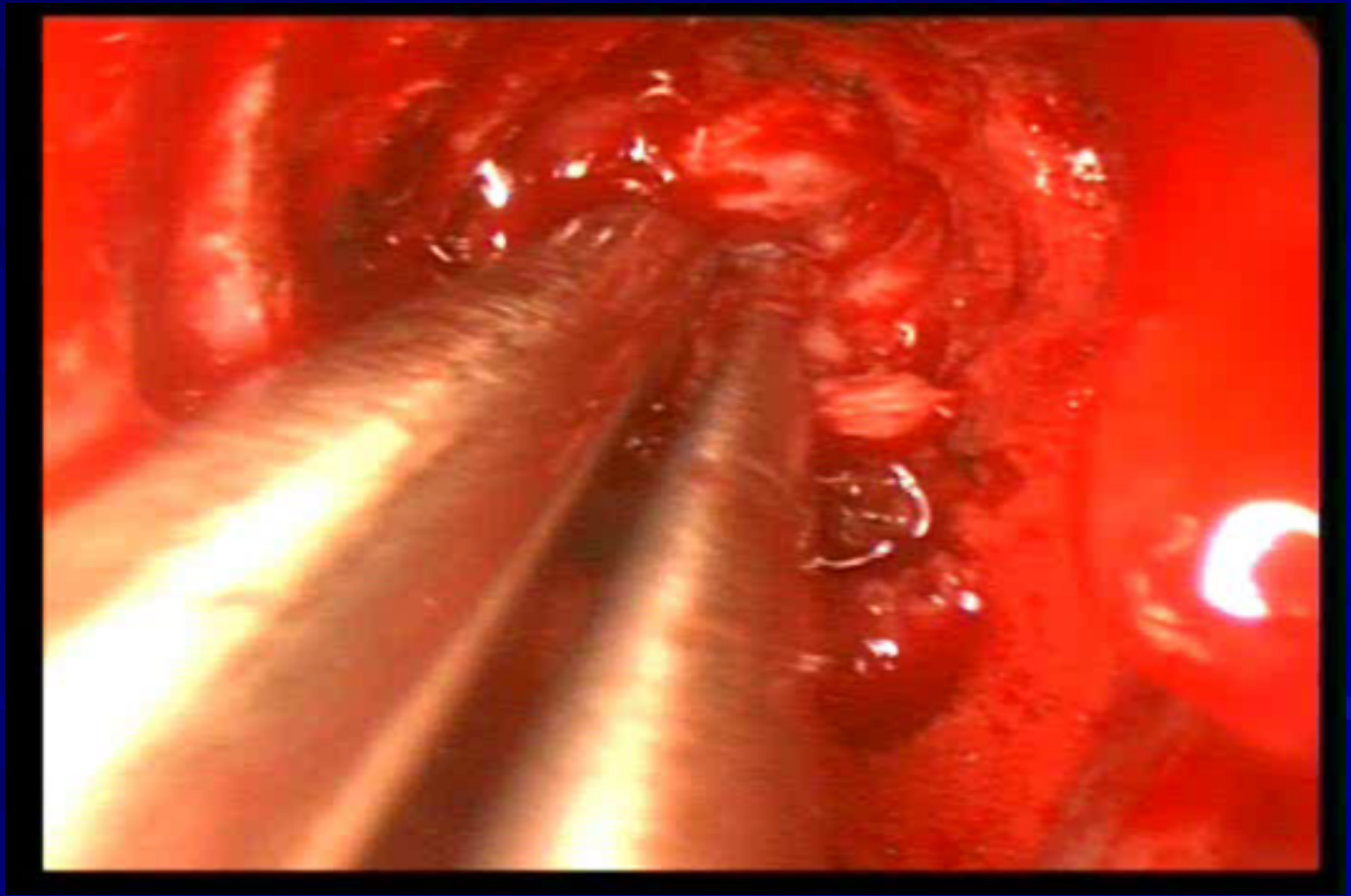
- If it is growing, or putting pressure on surrounding structures should be treated
- Endocrine function
- Visual field testing



# Pituitary Adenoma

## ■ Transsphenoidal Resection





# Cushing's Disease

- ACTH-secreting tumor
- Treat with surgical resection



# Acromegaly



- Excess growth hormone secretion
- Enlarging hands and feet
- Bilateral carpal tunnel syndrome
- Diabetes mellitus
- Dilated cardiomyopathy

# Acromegaly

- Measure IGF-1
- Can try somatostatin analogs
- Oftentimes requires surgical resection



# Prolactinoma

- Patient may have nipple discharge
- Elevated Prolactin
- Usually greater than  $> 200$  ng/mL
- Can be treated with Bromocriptine



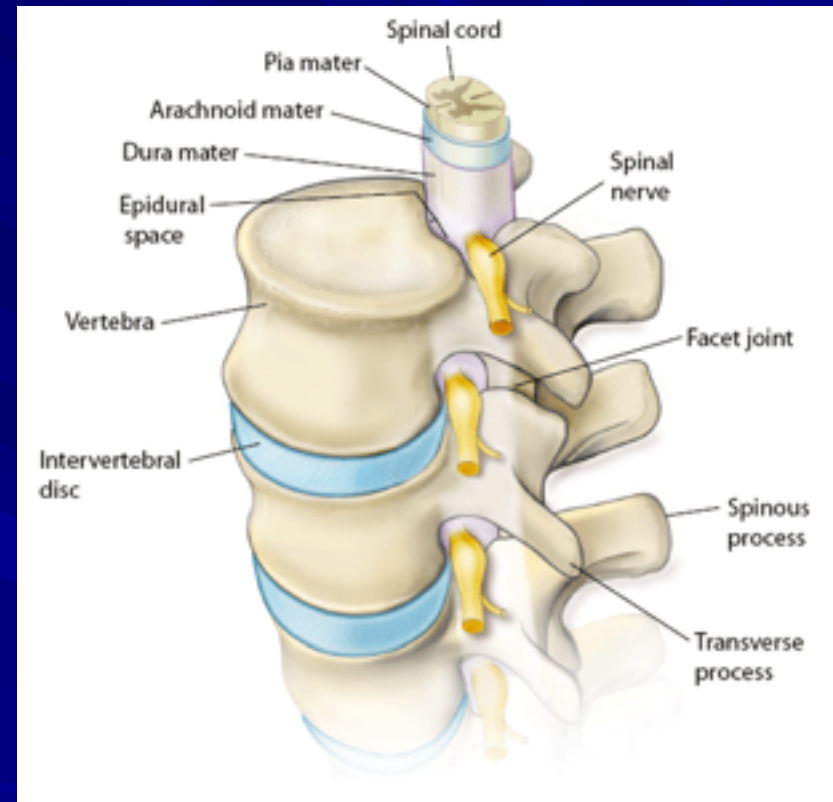


# Spinal Metastatic Disease



# Spinal metastatic disease

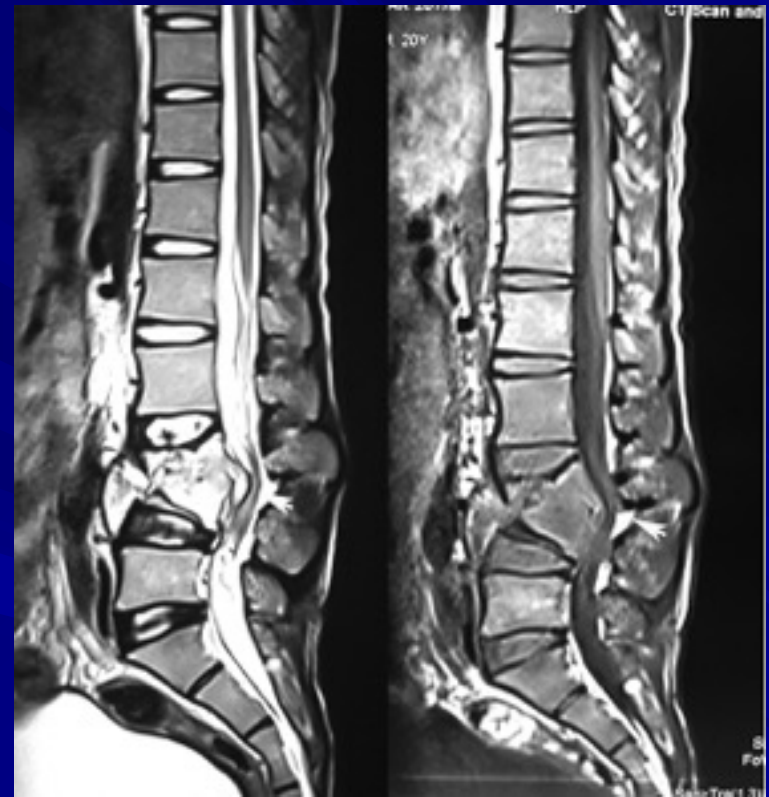
- Most frequent area of spine for metastases is vertebral body
- May present with pain or neurologic deficit



# Spinal metastatic disease

## Spinal Cord Compression:

- Myelopathy – hyperreflexia, clonus
- Numbness
- Weakness
- Incontinence



# Spinal metastatic disease

General Indications for surgery:

- Neurologic deficit
- Spinal Instability

# Spinal Metastatic Disease

Lancet. 2005 Aug 20;366(9486):643-8.

## Direct decompressive surgical resection in the treatment of spinal cord compression caused by metastatic cancer: a randomised trial.

Patchell RA, Tibbs PA, Regine WF, Payne R, Saris S, Kryscio RJ, Mohiuddin M, Young B.

Department of Surgery (Neurosurgery), University of Kentucky Medical Center, Lexington, KY 40536, USA. rpatchell@aol.com

### Abstract

**BACKGROUND:** The standard treatment for spinal cord compression caused by metastatic cancer is corticosteroids and radiotherapy. The role of surgery has not been established. We assessed the efficacy of direct decompressive surgery.

**METHODS:** In this randomised, multi-institutional, non-blinded trial, we randomly assigned patients with spinal cord compression caused by metastatic cancer to either surgery followed by radiotherapy (n=50) or radiotherapy alone (n=51). Radiotherapy for both treatment groups was given in ten 3 Gy fractions. The primary endpoint was the ability to walk. Secondary endpoints were urinary continence, muscle strength and functional status, the need for corticosteroids and opioid analgesics, and survival time. All analyses were by intention to treat.

**FINDINGS:** After an interim analysis the study was stopped because the criterion of a predetermined early stopping rule was met. Thus, 123 patients were assessed for eligibility before the study closed and 101 were randomised. Significantly more patients in the surgery group (42/50, 84%) than in the radiotherapy group (29/51, 57%) were able to walk after treatment (odds ratio 6.2 [95% CI 2.0-19.8] p=0.001). Patients treated with surgery also retained the ability to walk significantly longer than did those with radiotherapy alone (median 122 days vs 13 days, p=0.003). 32 patients entered the study unable to walk; significantly more patients in the surgery group regained the ability to walk than patients in the radiation group (10/16 [62%] vs 3/16 [19%], p=0.01). The need for corticosteroids and opioid analgesics was significantly reduced in the surgical group.

**INTERPRETATION:** Direct decompressive surgery plus postoperative radiotherapy is superior to treatment with radiotherapy alone for patients with spinal cord compression caused by metastatic cancer.

# Patchell Study

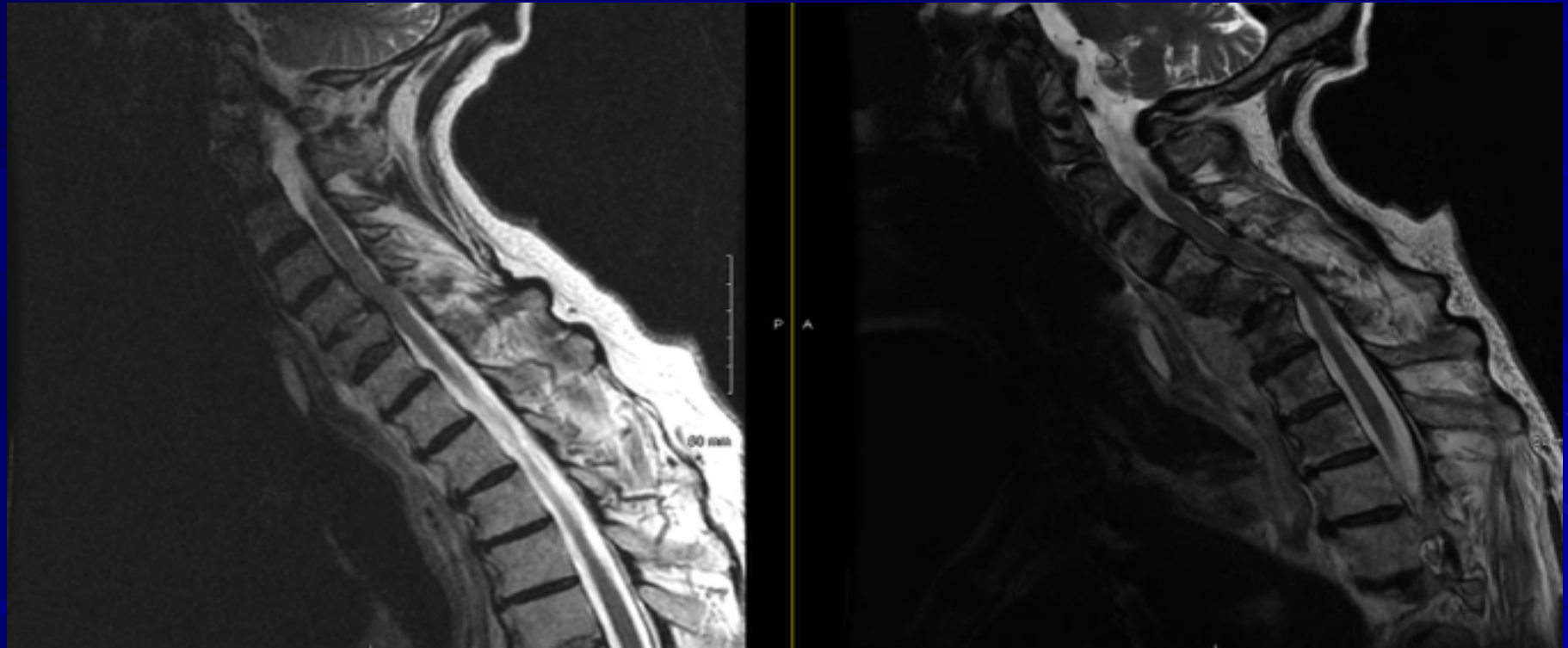
- Non-blinded randomized controlled trial
- Patients with metastatic disease causing spinal cord compression
- Radiation alone (n=51)
- Surgery + Radiation (n=50)
- Primary endpoint ability to ambulate

# Patchell Study

Surgical group:

- Improved ambulation
- Improved survival and functional status
- Decreased need for steroids and opioids

# Spinal Metastatic Disease





# Spinal Metastatic Disease

- <3 months prognosis – Surgery not indicated
- 3-6 months prognosis – Grey zone
- >6 months prognosis – Consider surgery

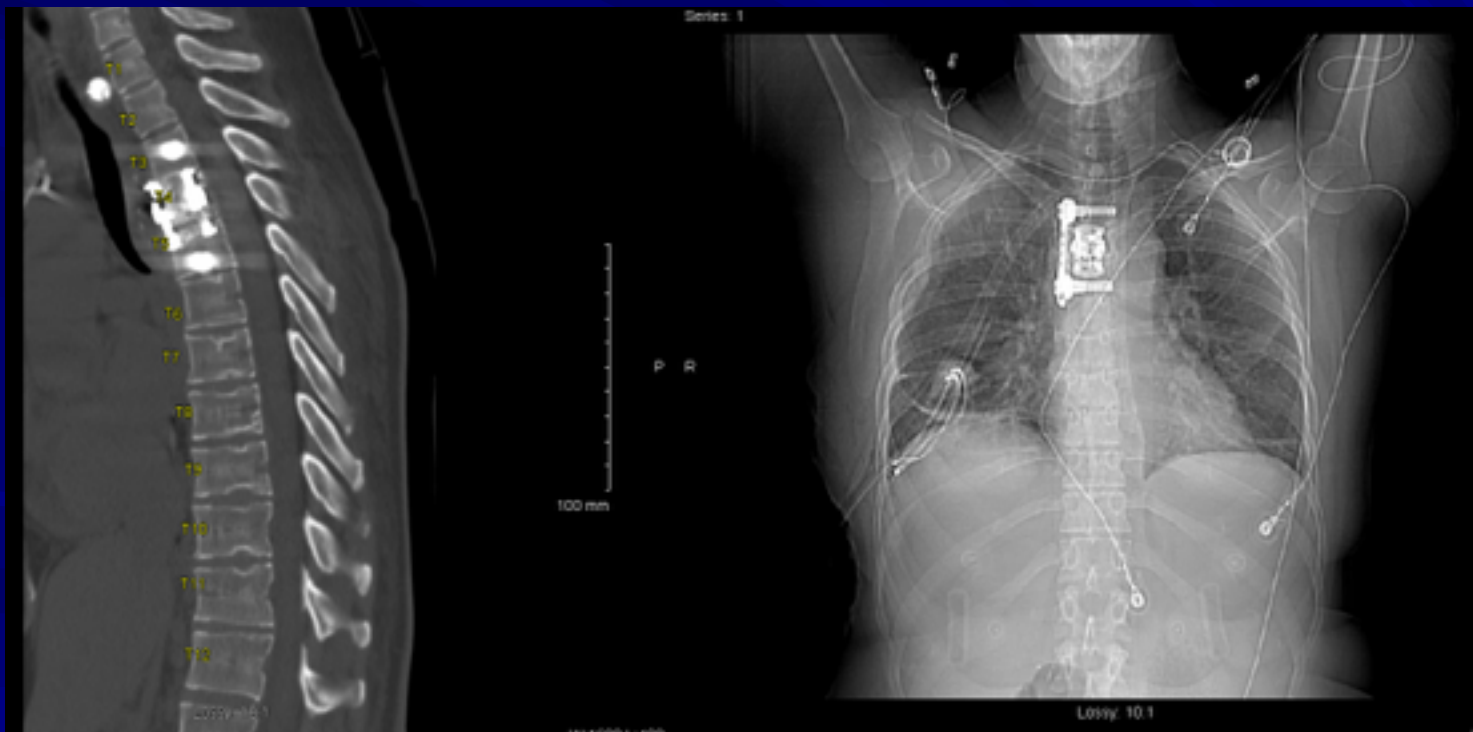


# Spine Case

- 42 yo female with colon adenocarcinoma and back pain
- PET scan “hot” in thoracic spine
- Full strength on exam, hyperreflexic



■ Underwent thoracic corpectomy and fusion followed by radiation

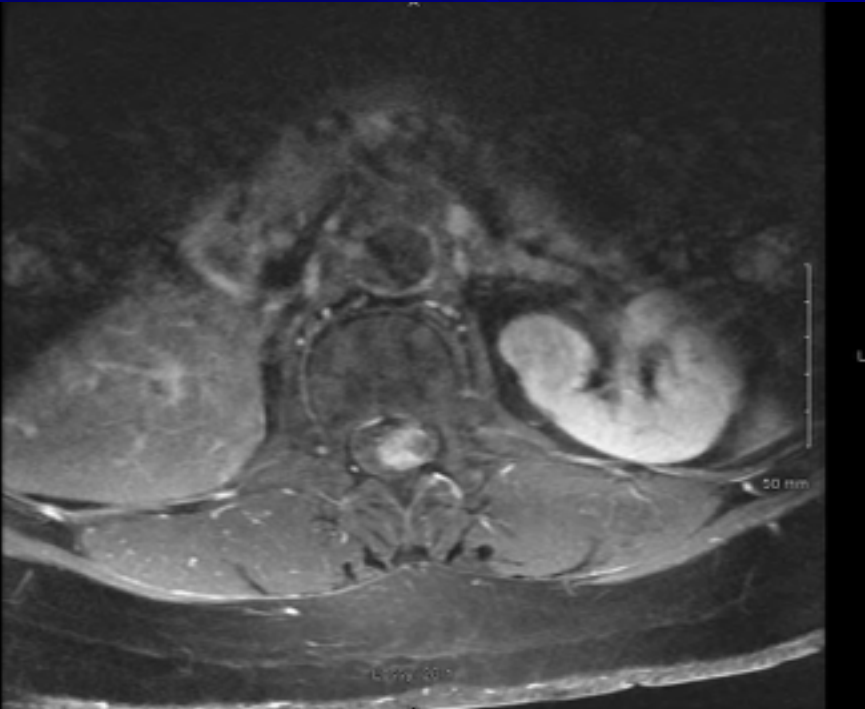


# Case

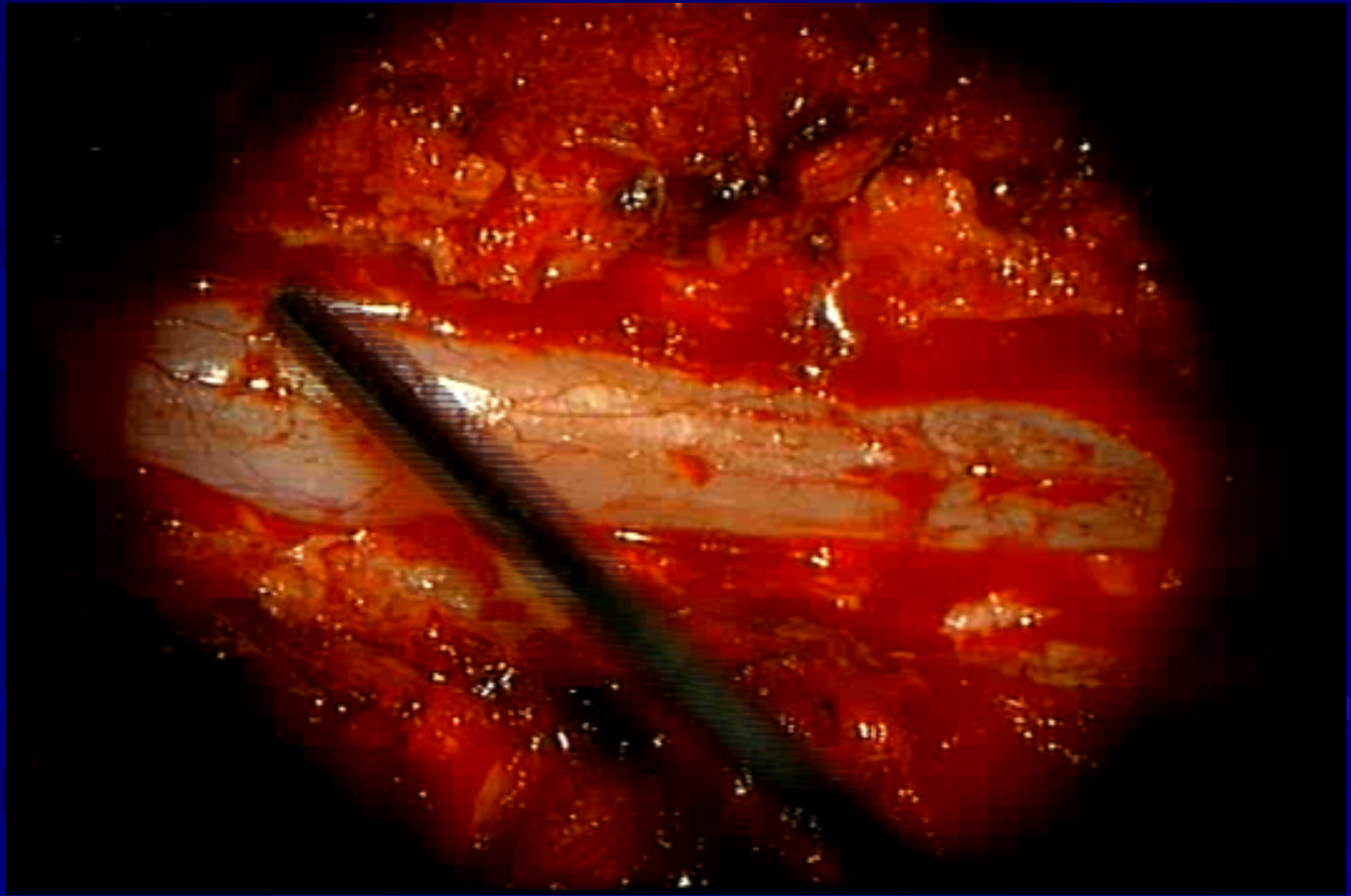
## Intradural Intramedullary Metastasis

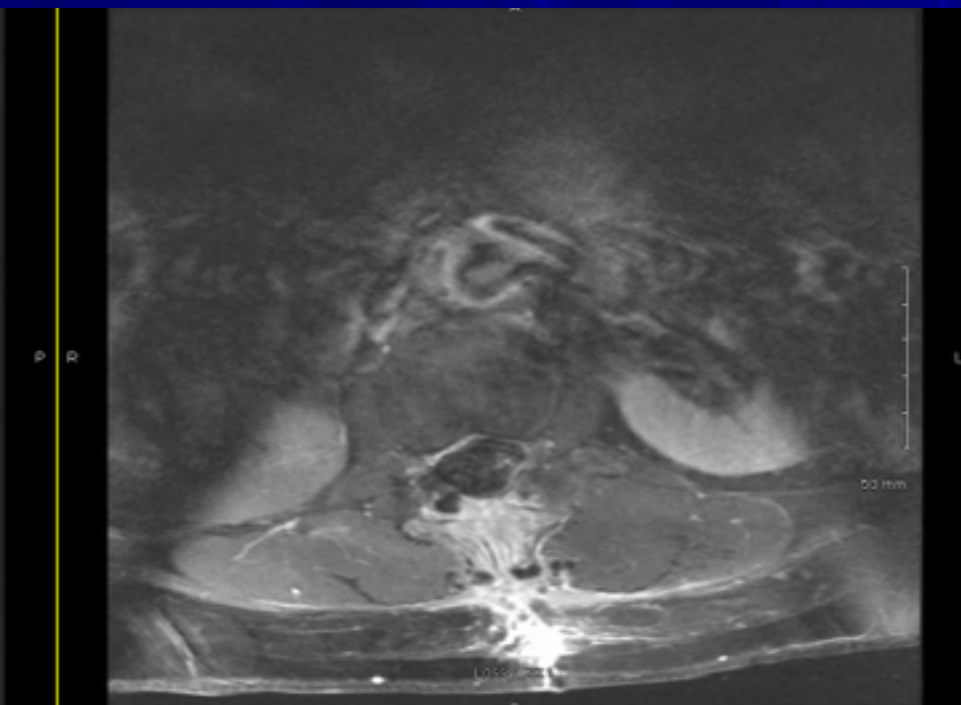
# Intradural Intramedullary Metastasis

- 66 yo Left LE pain and weakness
- Hx of Renal mass removed 2 years ago at OSH without follow-up
- L4 radiculopathy and Left 4/5 dorsiflexion









# Summary

- Consider surgery when evaluating patients with spinal metastatic disease
- Patients with a neurologic deficit from spinal compression and  $> 6$  months prognosis are the best candidates

# Learning Points

- Dexamethasone Side Effects
- High Grade glioma = GBM
- Standard GBM Therapy
- Meningioma
- Hydrocephalus
- Intrathecal Chemotherapy
- Pituitary Tumor Effects
- Indications for Spine surgery

# Thank you!

