

# Treatment of Brain Metastases

(a surgeon's perspective)

CAGPO

September 30, 2016

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Co-Chair, BCCA/BC Stereotactic Radiosurgery Program (1997-2012)

# Disclosures

- ◆ Monteris Medical
- ◆ BCCA
- ◆ UBC

# Objectives

- ◆ Discuss the ideal management for metastatic brain disease

- ◆ What to do with a patient with a metastatic brain tumor?

# Attitude shift



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ORIGINAL ARTICLE

## A Randomized Trial of Surgery in the Treatment of Single Metastases to the Brain

Roy A. Patchell, M.D., Phillip A. Tibbs, M.D., John W. Walsh, M.D., Robert J. Dempsey, M.D., Yosh Maruyama, M.D., Richard J. Kryscio, Ph.D., William R. Markesbery, M.D., John S. Macdonald, M.D., and Byron Young, M.D.  
N Engl J Med 1990; 322:494-500 | February 22, 1990 | DOI: 10.1056/NEJM19900223220802

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Abstract

Article

References

Citing Articles (1188)

Letters

METASTASES to the brain occur in 20 to 30 percent of patients with systemic cancer<sup>1</sup> and are the most common type of intracranial tumor.<sup>2-3</sup> The life expectancy of patients with brain metastases is short, and current treatment of such metastases is not very effective. Whole-brain radiation therapy is the current standard treatment, but patients treated with radiotherapy alone have a median length of survival of only three to six months.<sup>1-4 5 6 7 8 9 10</sup> Despite occasional responses in individual patients, chemotherapy has not been shown to improve the survival of most patients with brain metastases.<sup>1-11-12</sup> Approximately half of all metastases to the brain are single<sup>13</sup> and therefore potentially treatable by surgical resection. The role of surgery in the management of brain metastases has been controversial, however, because of the complete absence of controlled clinical trials.

For over 60 years,<sup>14-15</sup> surgery has occasionally been performed in patients with single brain metastases who otherwise have good prognoses. Uncontrolled retrospective studies of the effectiveness of surgical treatment have had conflicting results; several studies<sup>15 16 17 18 19 20 21</sup> have shown substantial benefit from surgery, whereas others<sup>6 7 8-22</sup> have found no benefit. Nonrandomized studies have been biased because the patients who received surgical treatment were those with minimal disease, whereas the patients treated with radiation alone were those with more extensive disease and poorer prognoses.

Uncontrolled studies have failed to determine what role, if any, surgery should have in the management of single brain metastases. In order to determine whether the surgical removal of single brain metastases resulted in improved survival and quality of life, we conducted a prospective, randomized trial comparing the effectiveness of surgery plus postoperative radiotherapy with that of radiotherapy alone.

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# Increase options= more complicated decisions

- ◆ Palliation
- ◆ Whole Brain Radiotherapy (WBRT)
- ◆ Craniotomy for resection
- ◆ Laser ablation
- ◆ Stereotactic Radiosurgery
- ◆ Combination therapy
- ◆ Chemotherapy

# NCCN Guidelines



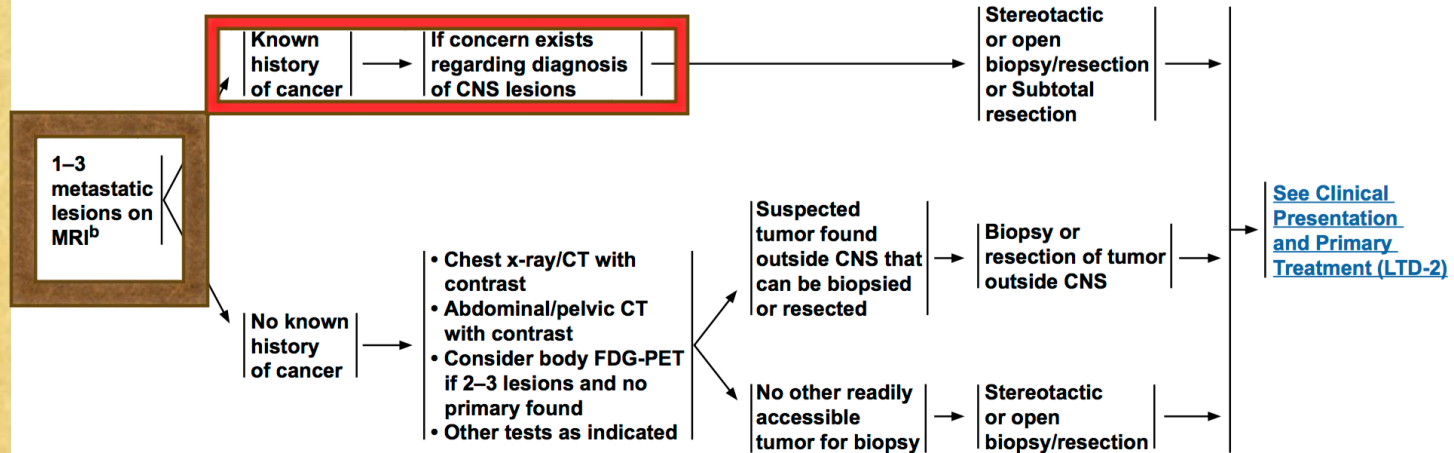
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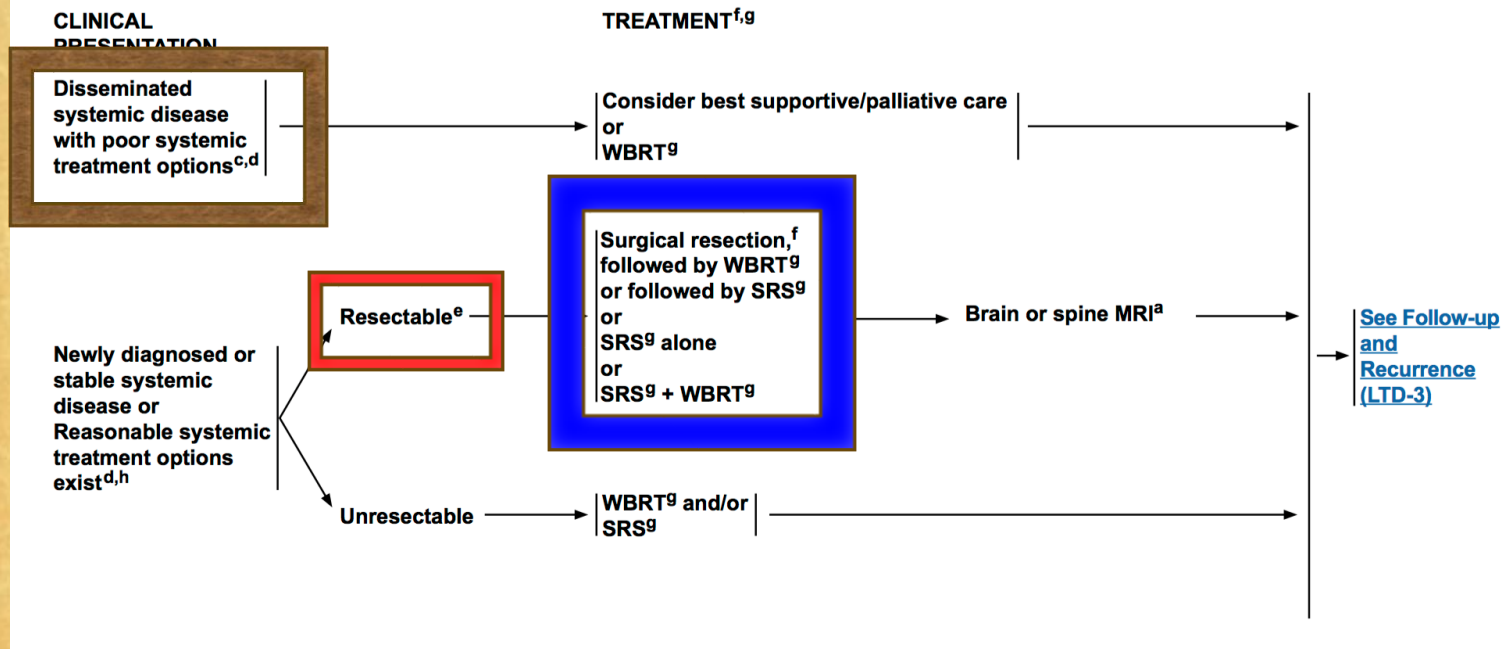
## NCCN Guidelines Version 1.2016 Limited (1–3) Metastatic Lesions

[NCCN Guidelines Index](#)  
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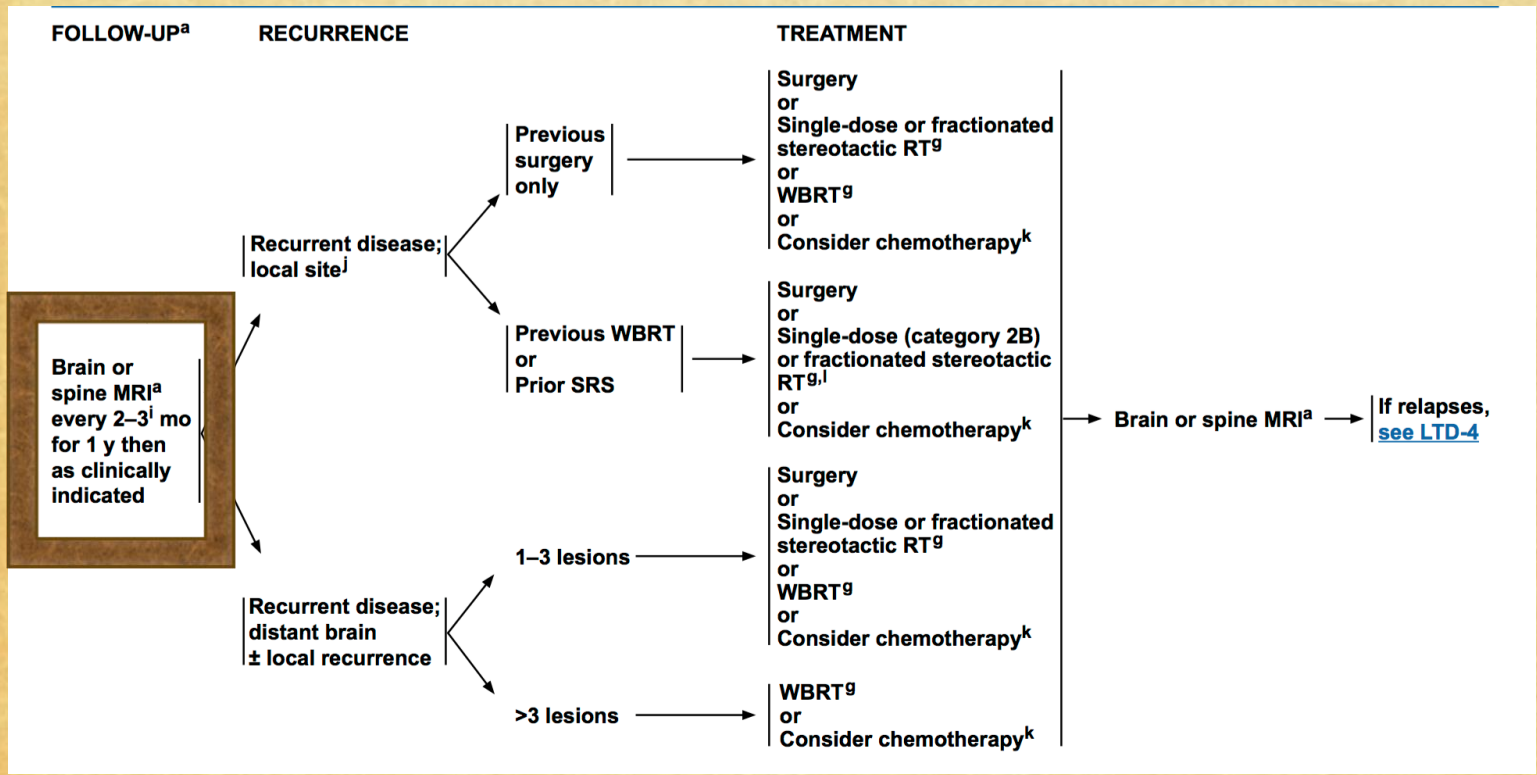
CLINICAL  
PRESENTATION<sup>a</sup>

WORKUP







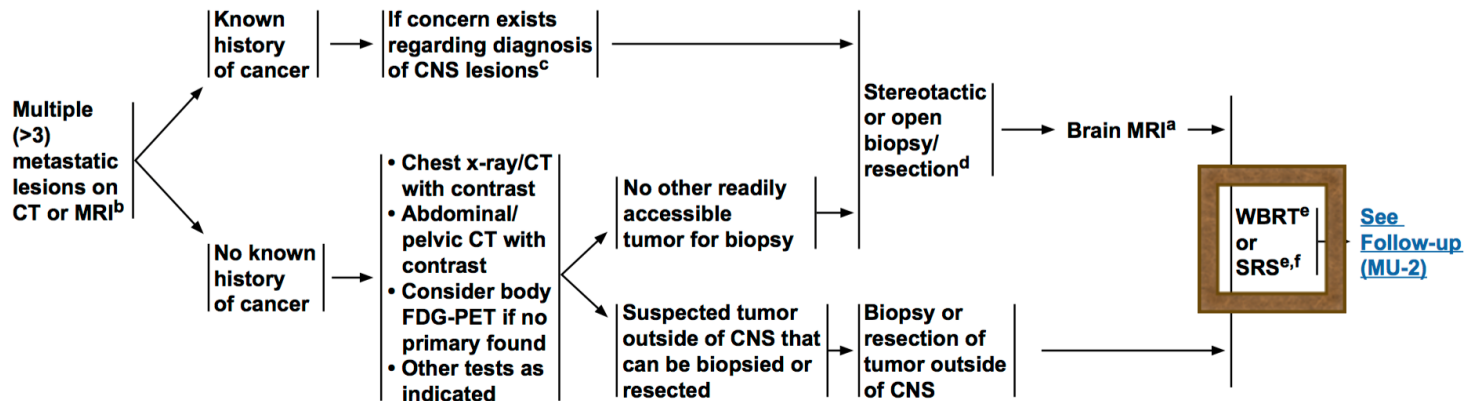


## NCCN Guidelines Version 1.2016 Multiple (>3) Metastatic Lesions

### CLINICAL PRESENTATION<sup>a</sup>

### WORKUP

### PRIMARY TREATMENT<sup>e</sup>



# suspect

- ◆ Known systemic cancer with any neurologic signs or symptoms (eg headache, nausea, seizures).....
- ◆ CT Head + C.... ASAP/within 2 weeks.

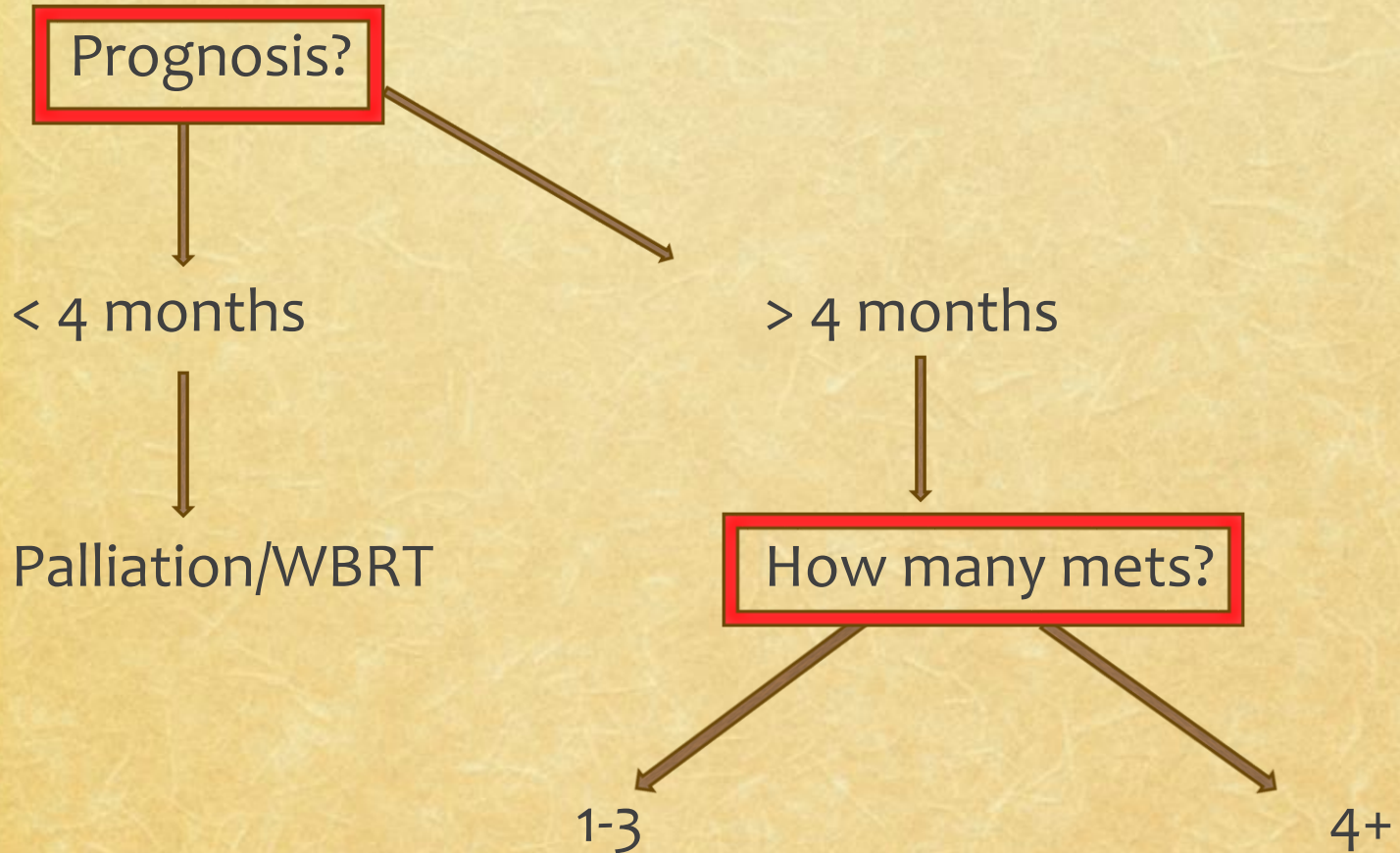
# Once diagnosed...

- ◆ questions?
  - ◆ Overall prognosis (regardless of brain met)
  - ◆ Number of mets

# CT reveals brain metastases....

- ◆ Prognosis?
- ◆ < 4 months : Palliative support/WBRT
- ◆ > 4 months:
  - ◆ How many metastases?
    - ◆ Pivotal number is 3...
    - ◆ 1-3 vs. >3 are different algorithms..
    - ◆ 1-3 aggressive treatments deployed
    - ◆ >3 minimal interventions deployed

# algorithm



# 4+ mets

- ◆ Generally treated with WBRT....
  - ◆ Nothing magical about 4, but literature consistently shows **no** added survival benefit from more invasive/morbidity-laden interventions with this number of brain lesions.
  - ◆ However, young patient with controlled primary disease... 1 large cerebellar met and 3 'tiny' supratentorial mets?....

# 1-3 metastases

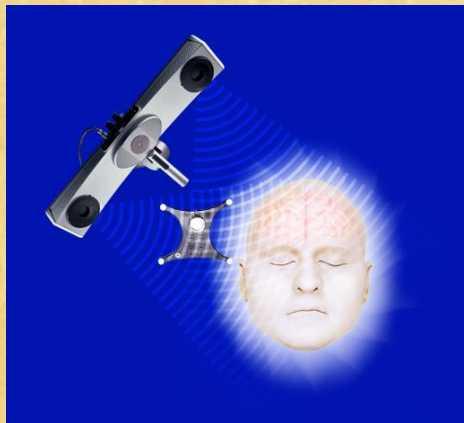
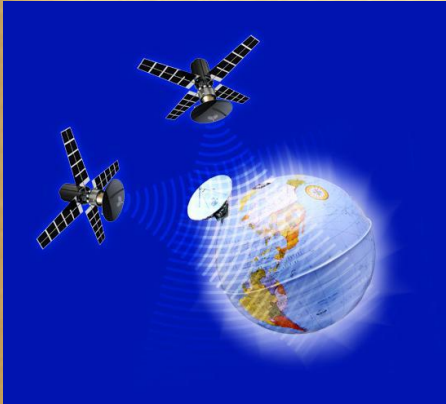
- ◆ Treated with surgery and/or stereotactic radiosurgery plus WBRT (?)
- ◆ Expectation?
  - ◆ No treatment or WBRT- survival of 3 months
  - ◆ With Sx/SRS- median 10-12 months, +++
    - ◆ Depends on control of the primary
    - ◆ Deaths are not neurologic
    - ◆ QOL - prolonged independence

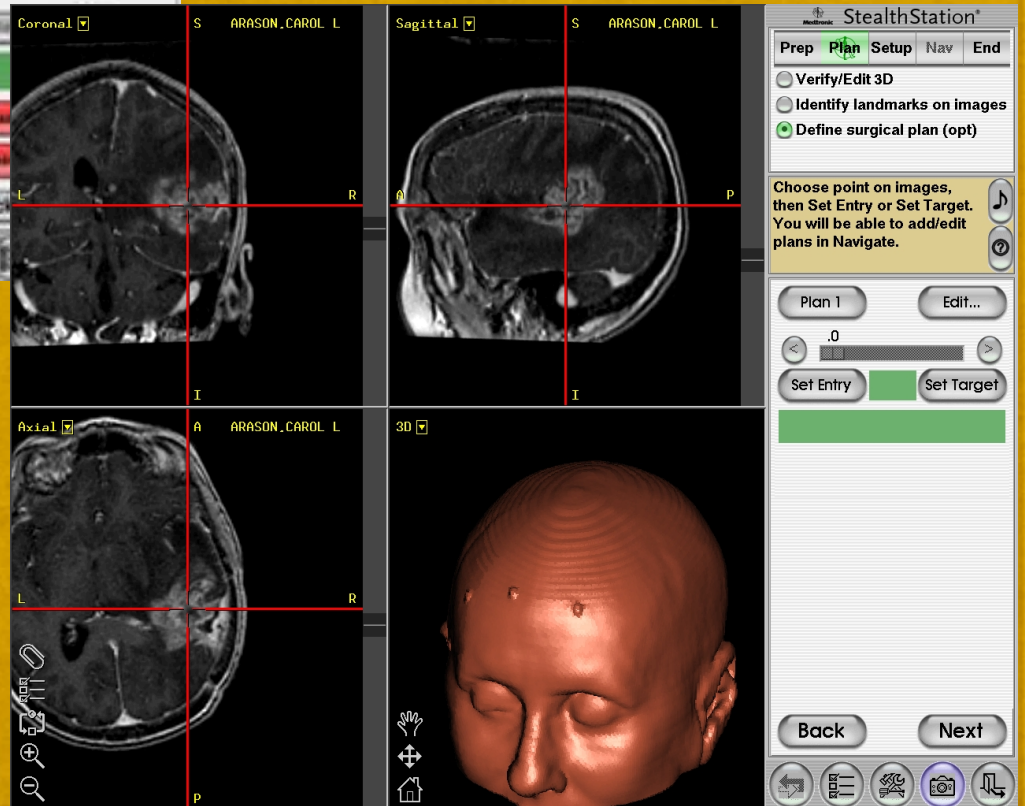


# Surgical options

- ◆ Craniotomy with resection
  - ◆ Short operation (1-2 hours)
  - ◆ Short LOS (2-4 days)
  
- ◆ Surgery made safer by technology

# Neuro-navigation









REVIEW

REGIONS

TARGETS

TRAJECTORIES

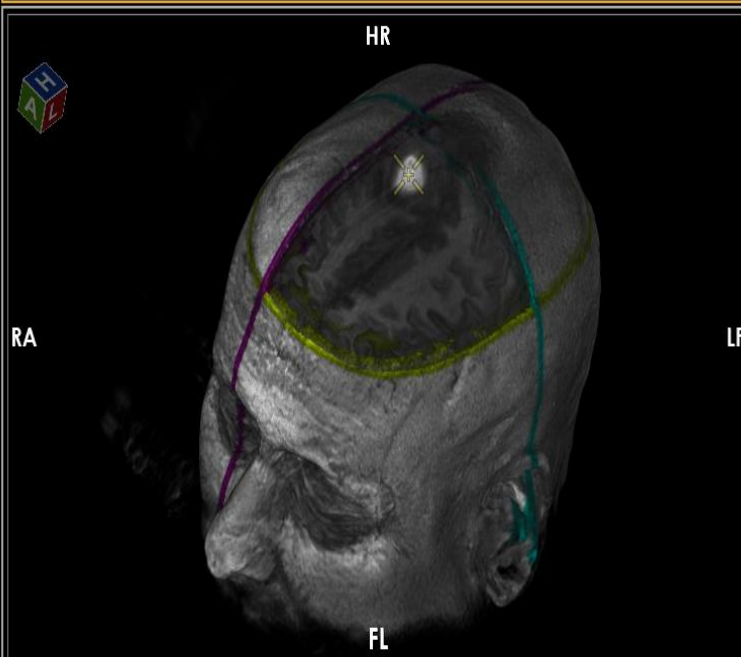
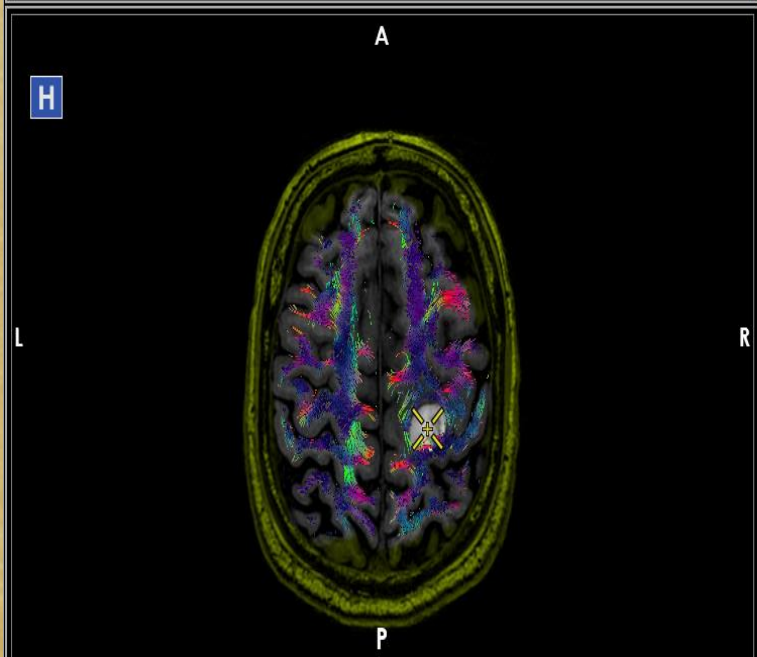
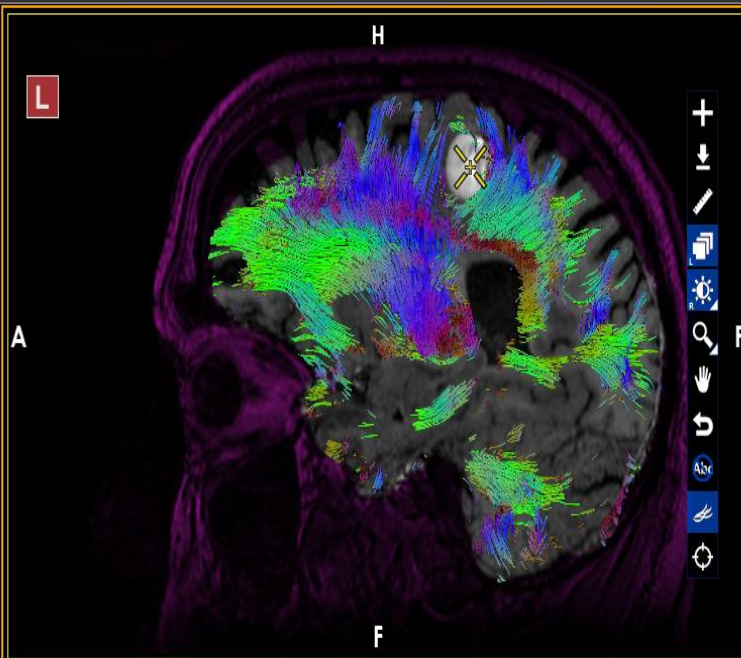
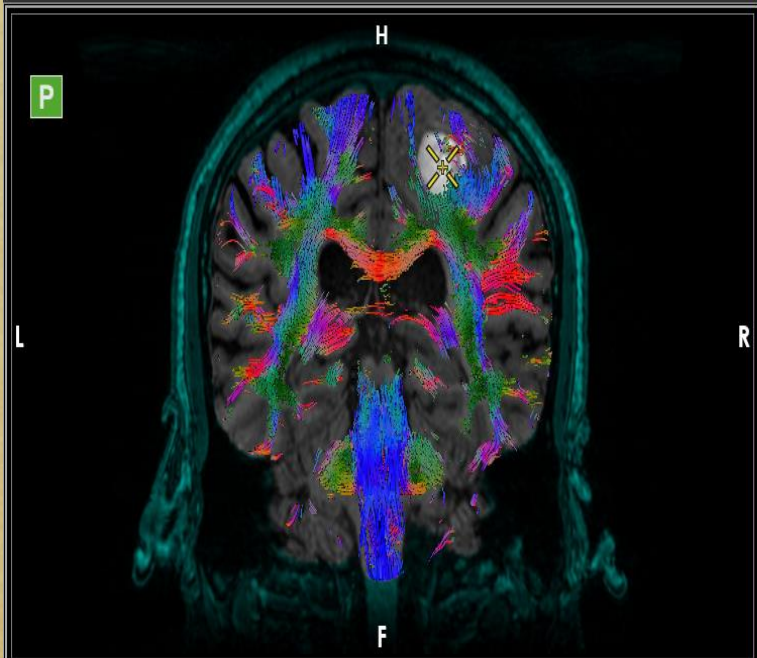
SULCAL PATHS

CRANIOTOMY

EXPORT



Port Planning



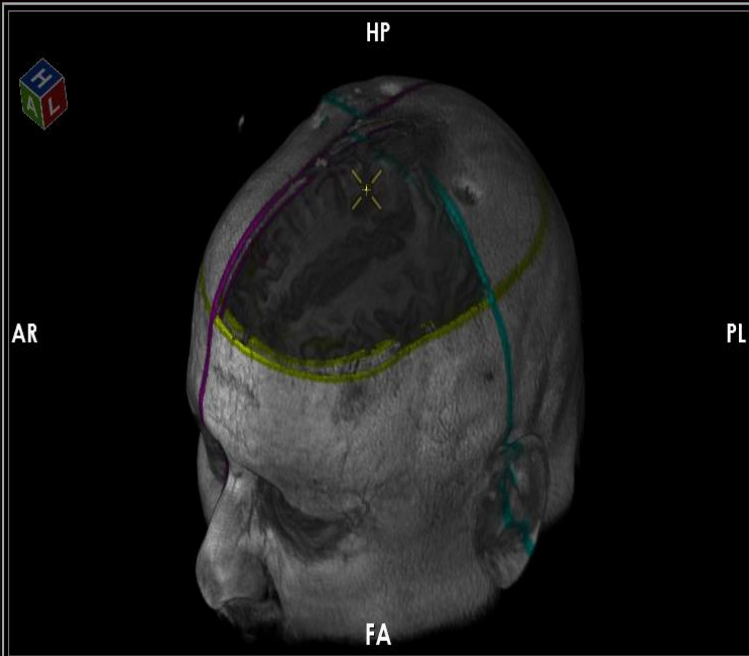
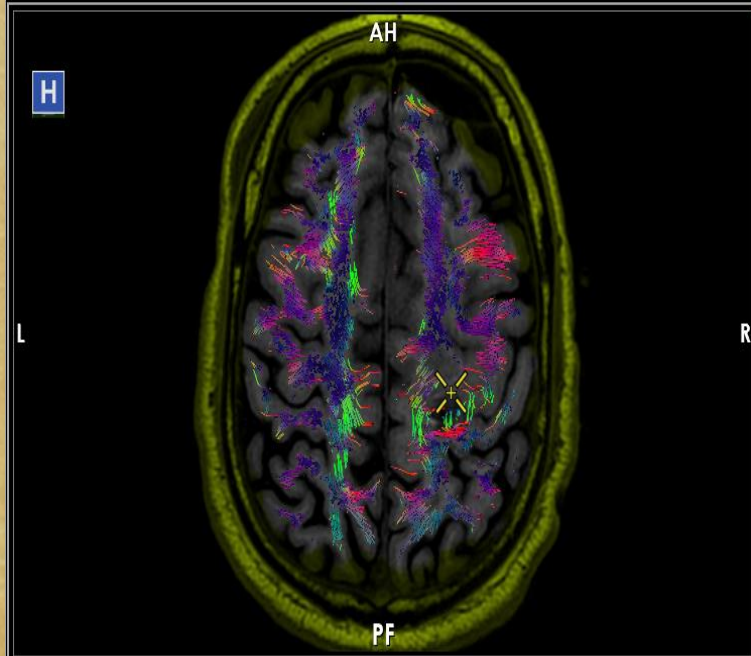
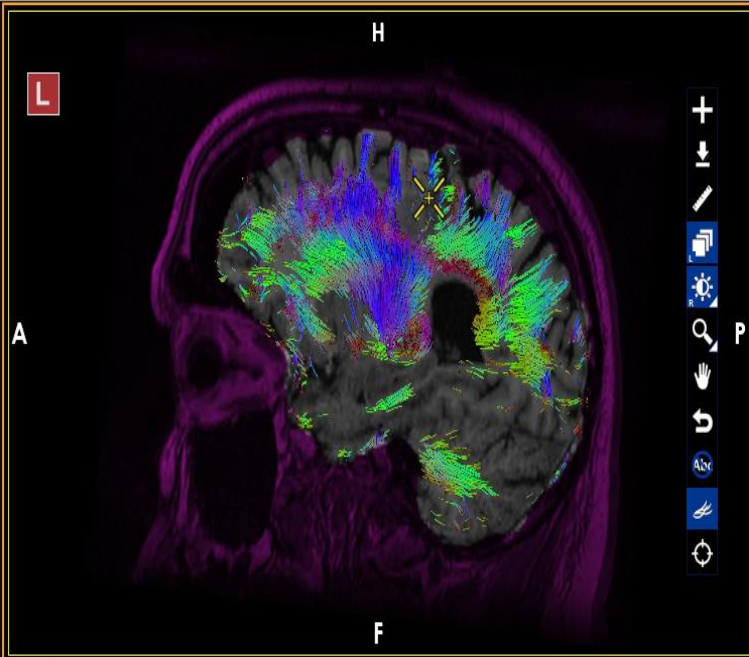
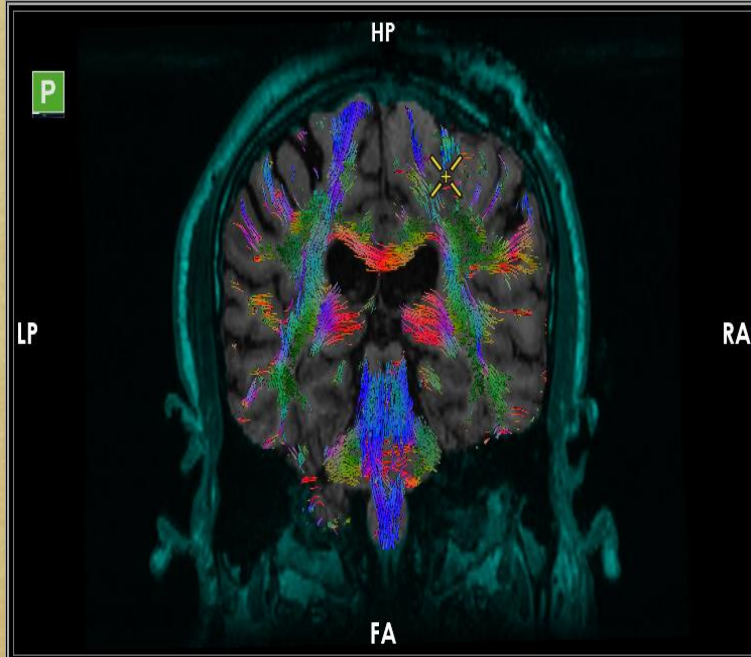
Move the spatial locator to examine possible target points.



Trajectories

- 1 Target
- + Target

- Overlays
- > Regions
  - > Tracts



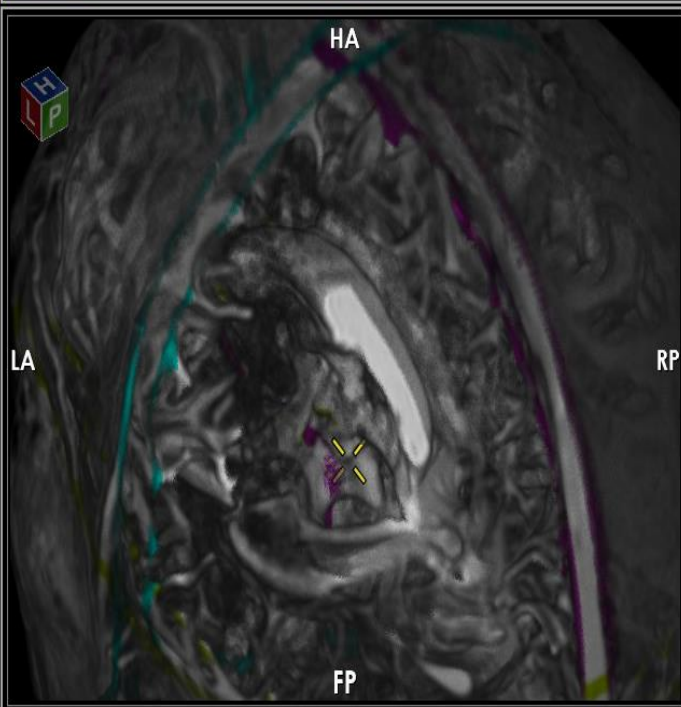
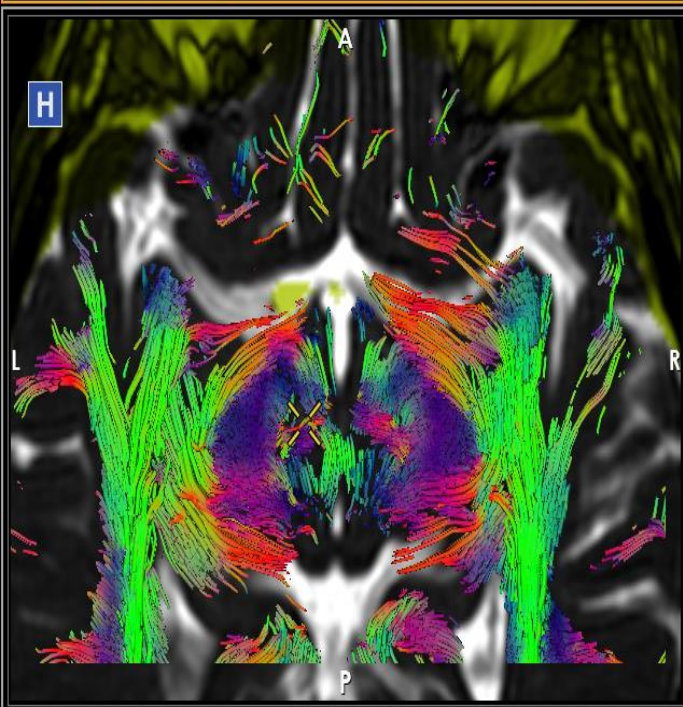
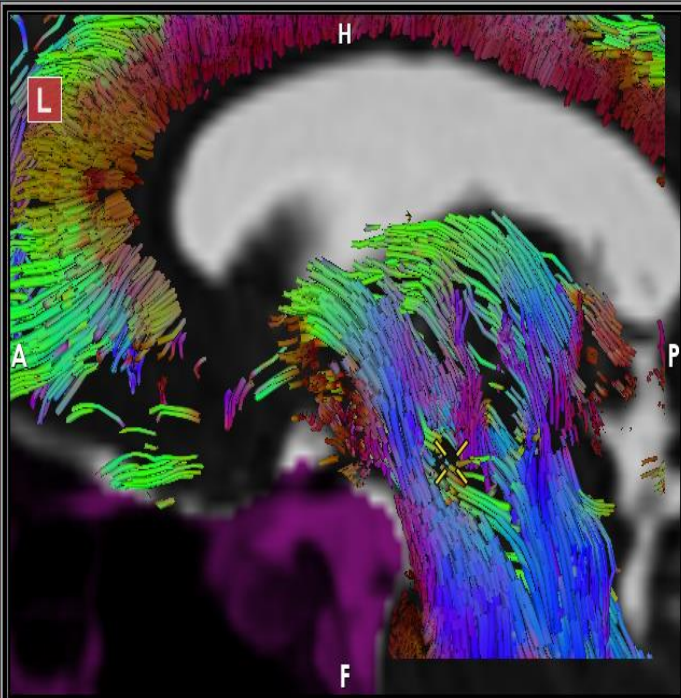
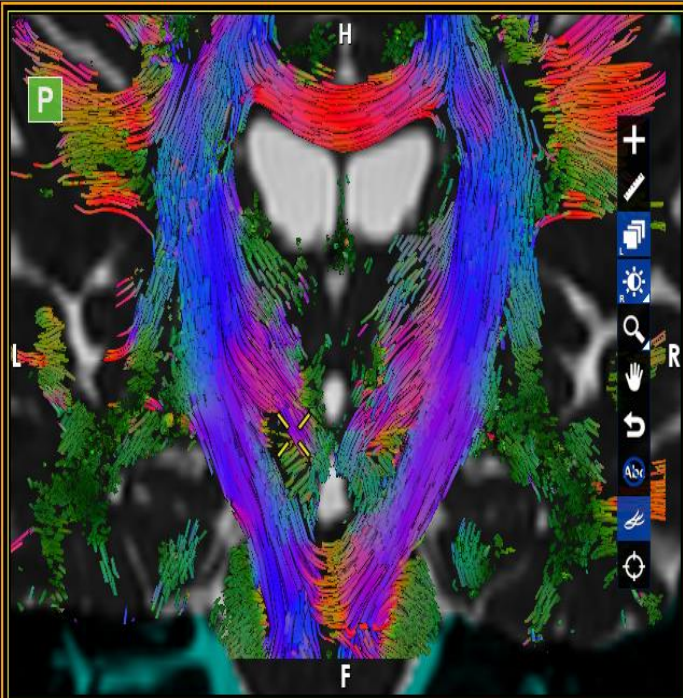
← Targets →

When you have found a good location, press the Add (+) button to place a target.



Trajectories

- 1 Target
- + Target

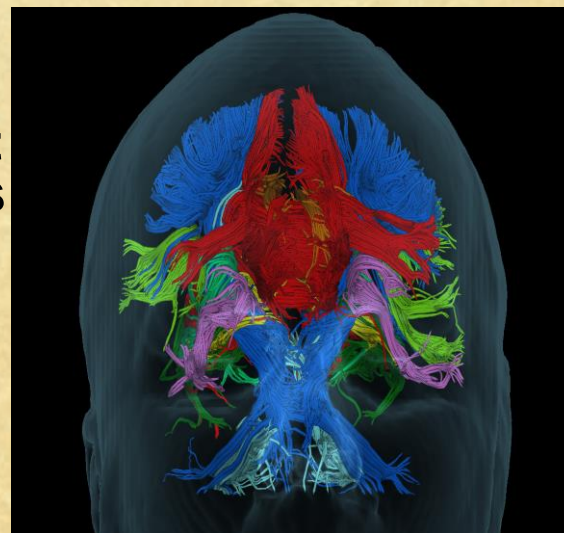


# Tractography – White Matter Segmentation (2015)

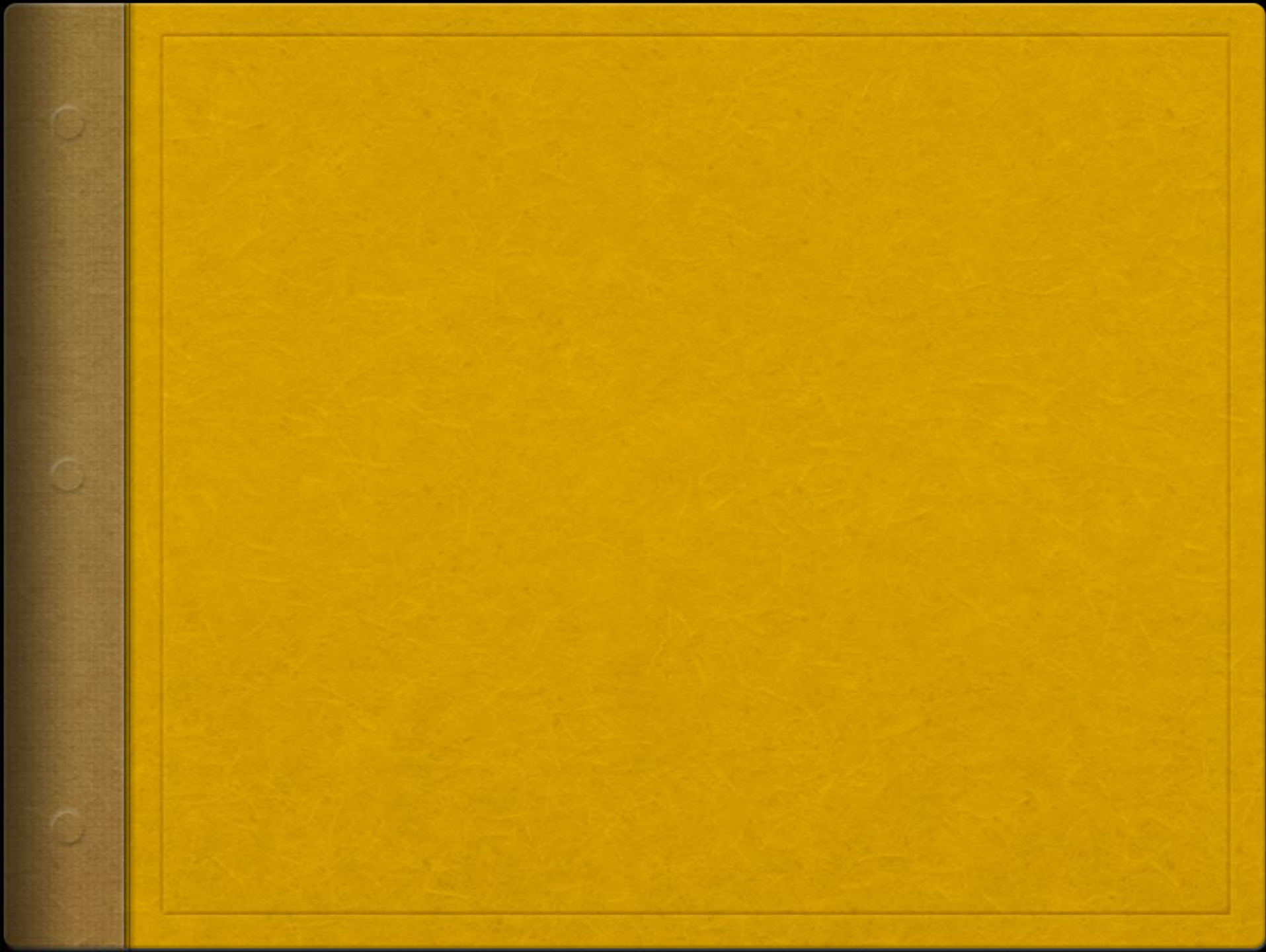
**Sagittal  
view of  
segmented  
tracts**



**Coronal  
view of  
segmented  
tracts**







## Survival and tumor recurrence in patients with brain metastases treated by surgical resection with or without adjuvant whole brain radiation therapy

Zeitschrift: [Journal of Radiation Oncology](#) > Ausgabe 2/2016

Autoren: Daljeet Chahal, Derrick G. Lee, Brian Toyota



 » Jetzt Zugang zum Volltext erhalten

### Abstract Objective

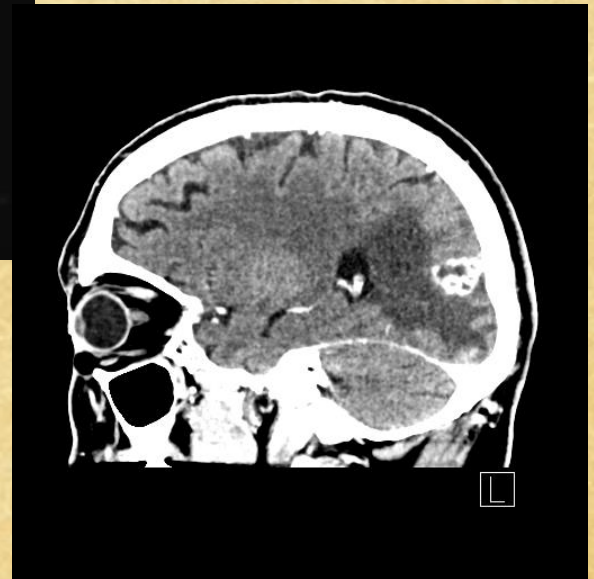
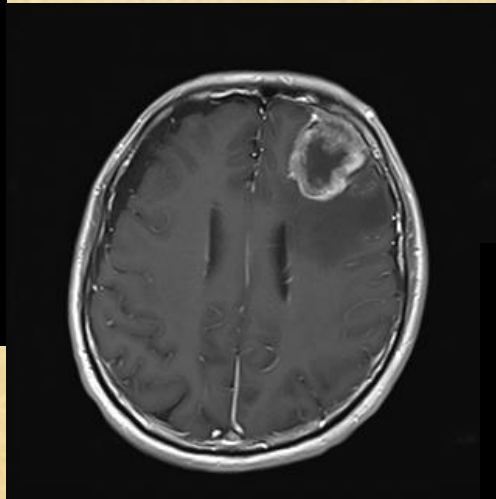
Tumors that metastasize to the brain are associated with poor survival and tend to recur at the original site after treatment. Adjuvant whole brain radiation therapy (WBRT) is recommended after surgical resection in order to decrease recurrence rates. However, prognostic factors that determine which patients may benefit from WBRT remain limited. We set out to characterize our experience with WBRT in these patients and identify prognostic factors.

### Methods

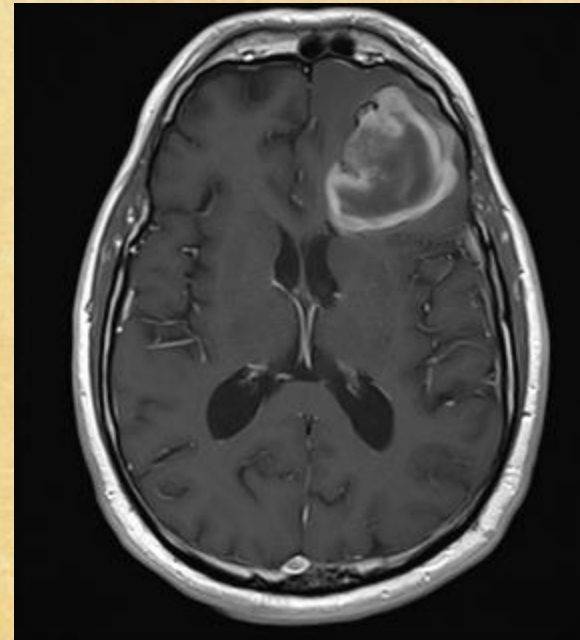
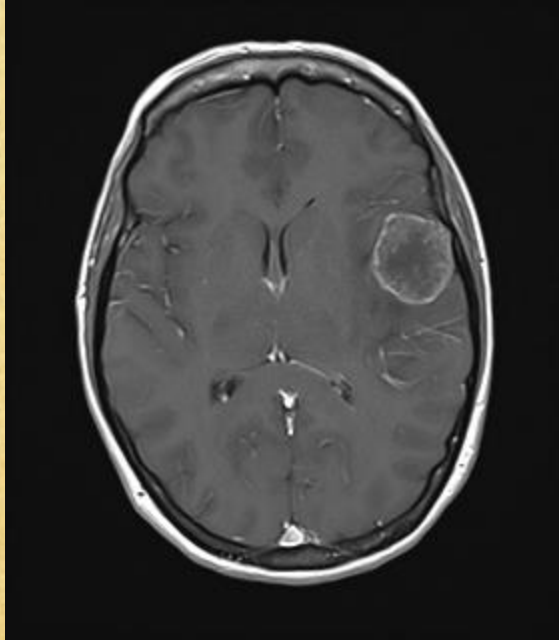
Ninety-eight patients who underwent surgical resection for metastatic brain tumors were identified by retrospective chart review. Demographic data was collected, patient survival and tumor recurrence rate after treatment were assessed using the Kaplan-Meier analysis and the Cox-proportional hazard regression while controlling for confounders.

- 98 consecutive cases reviewed
- 17 recurrences
- Survival benefit with WBRT
- neuro-cognition not assessed.

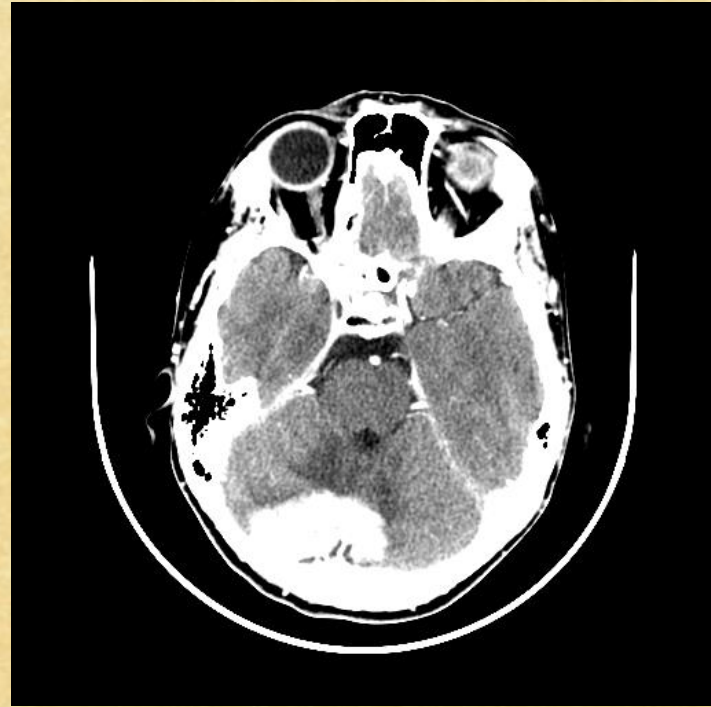
# cases



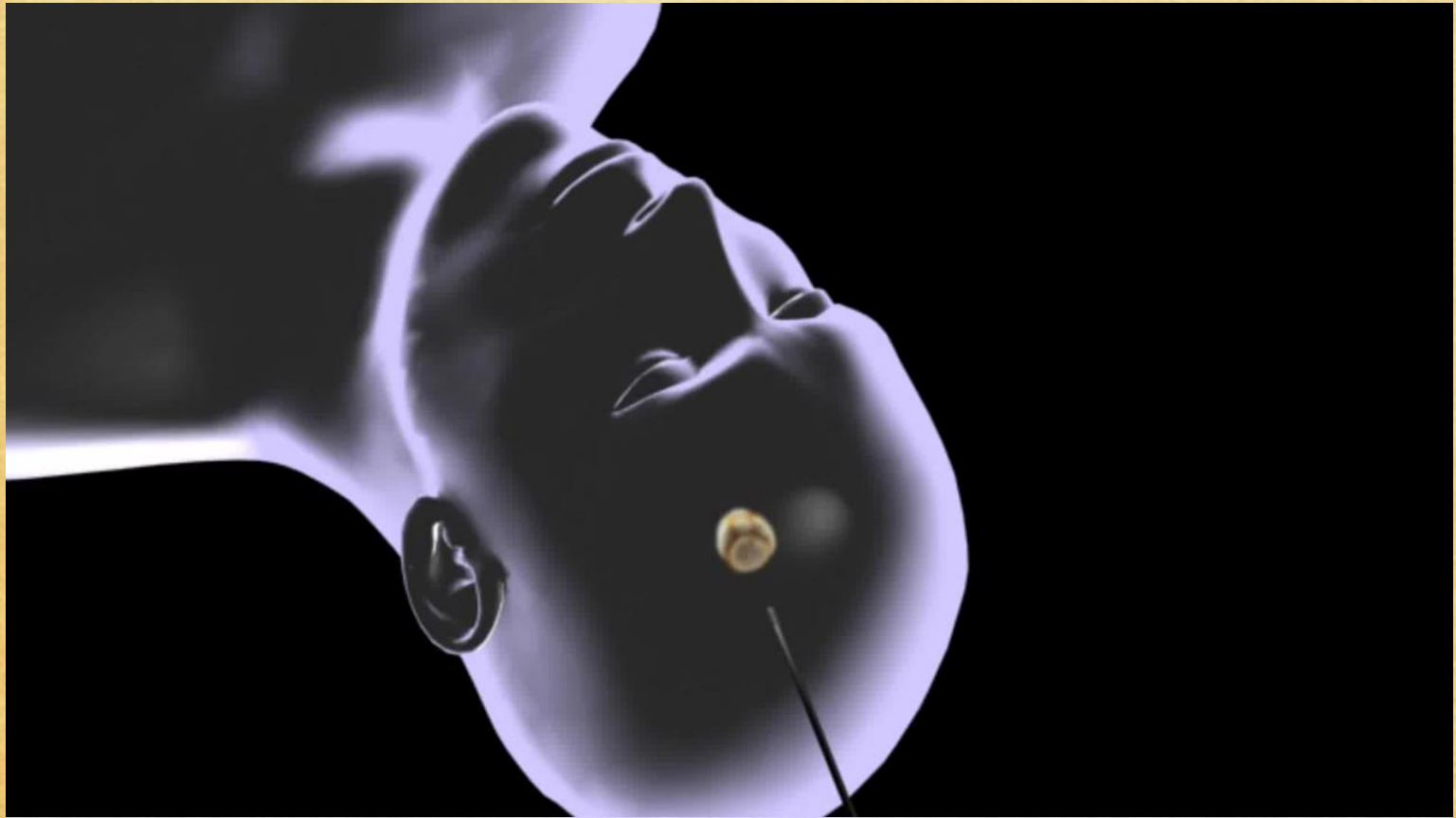
# cases



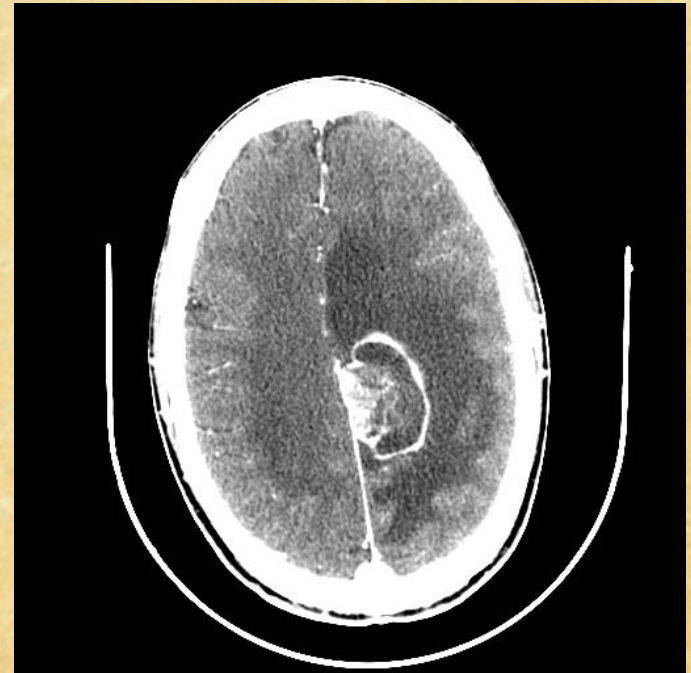
# cases



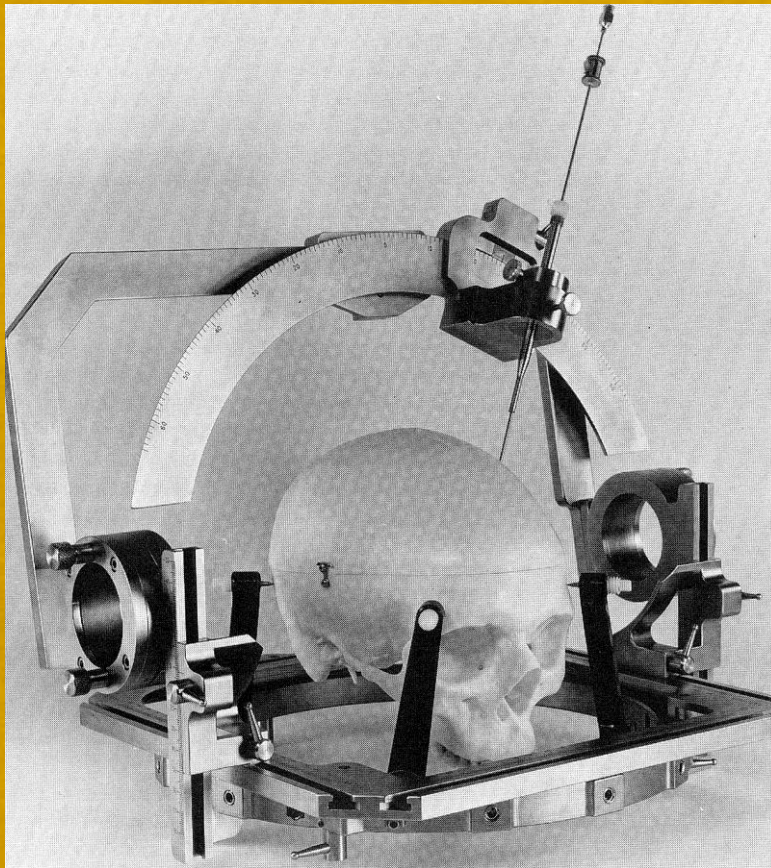
# Interstitial laser ablation



# Neuroblate cases



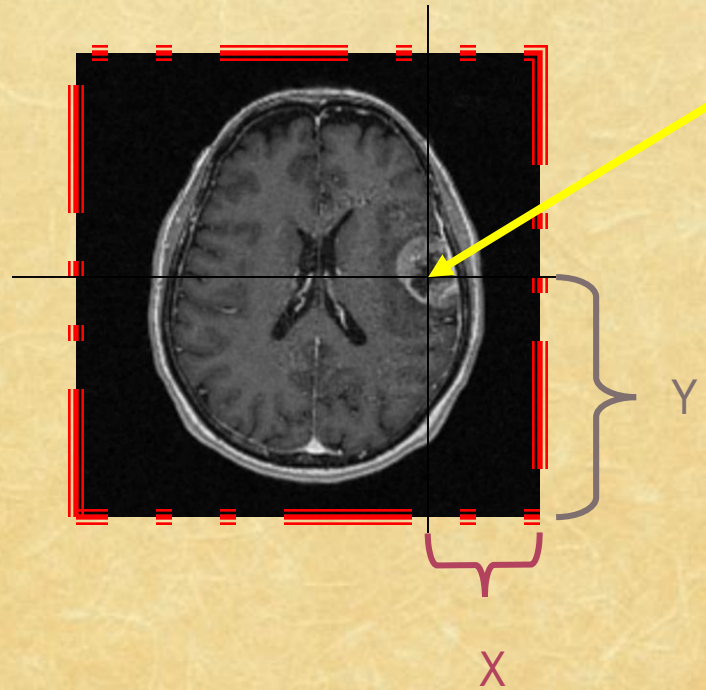
# Stereotactic Radiosurgery



- ◆ Frame applied to the head
- ◆ Imaging performed with frame applied
- ◆ Frame provides reference measurements for targeting

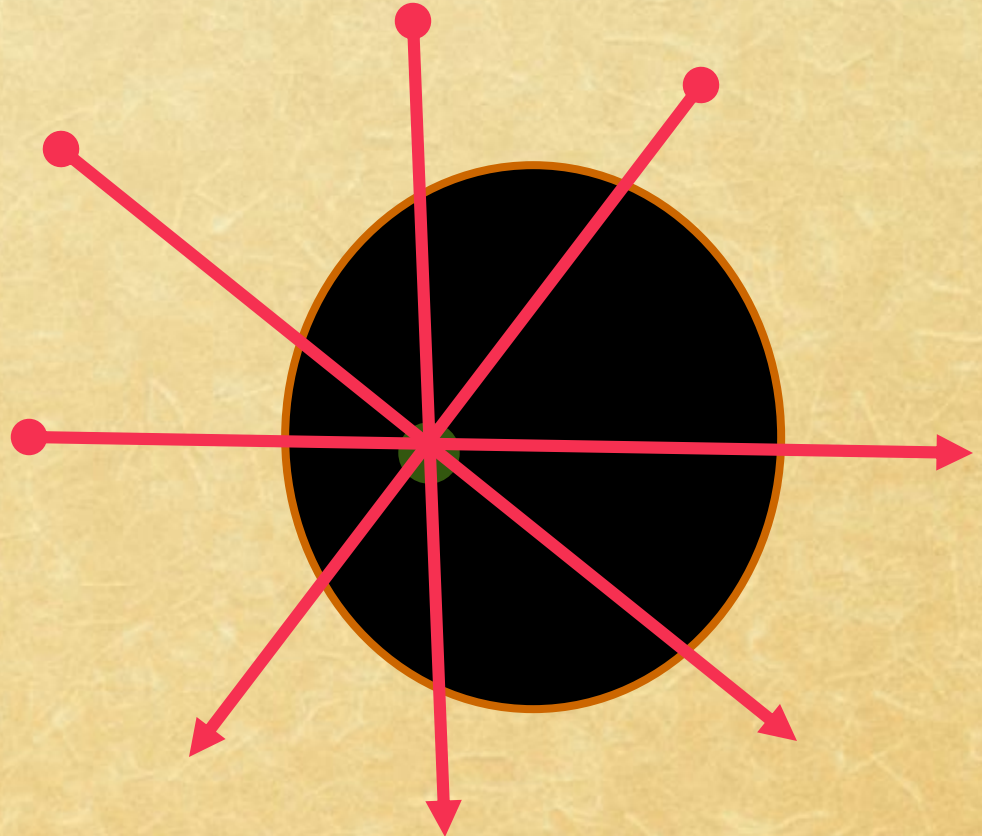
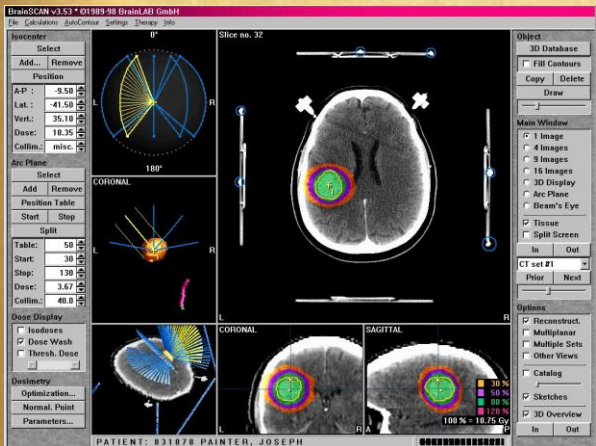


# Fixed-Frame Stereotaxy



# Stereotactic Radiosurgery

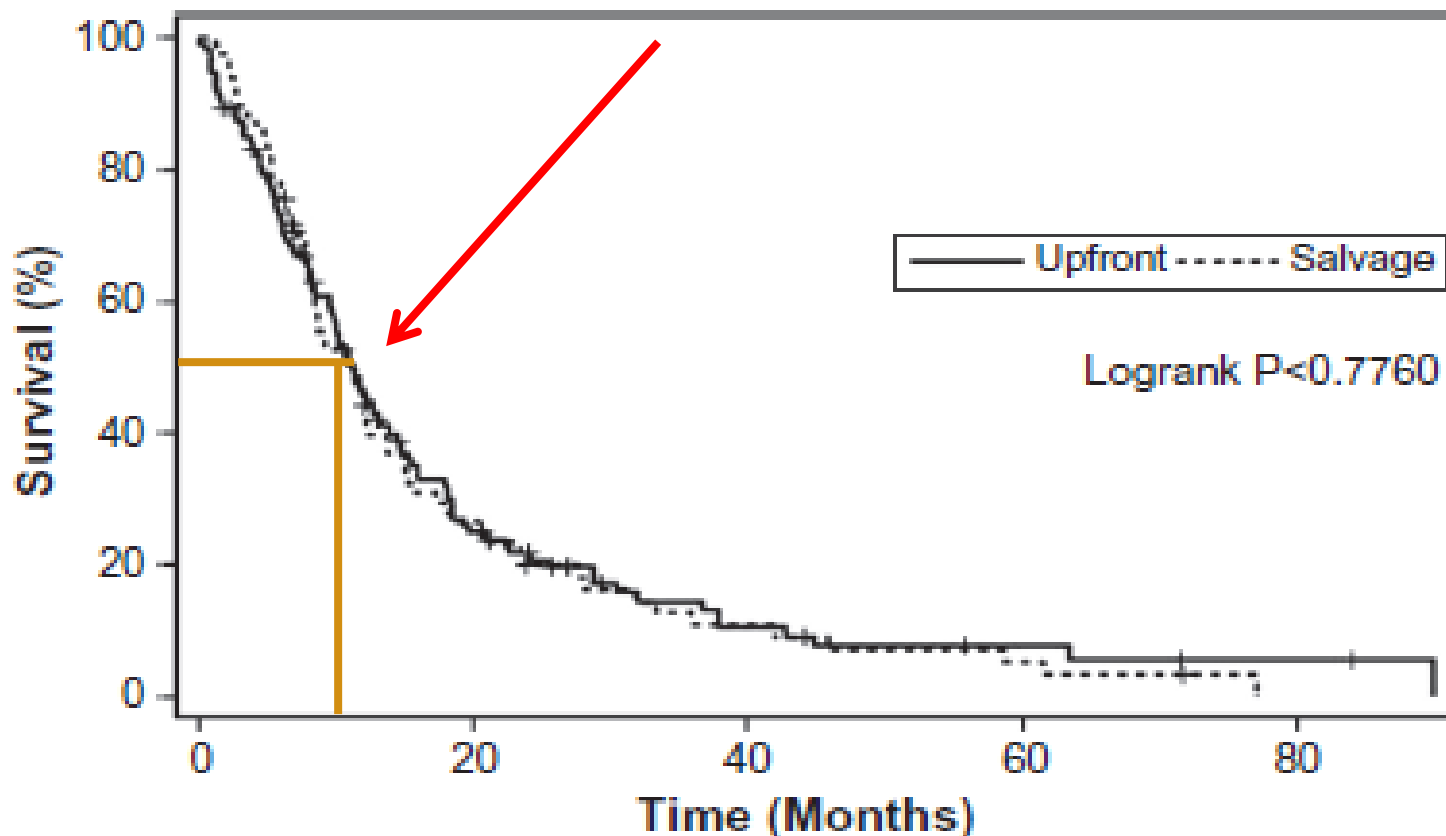
- Head fixed in a stereotactic frame
- Radiation directed at the lesion from different orientations, but all converging at the same point (the lesion).



# SRS +WBRT in BC ~30/yr (6%)

Hsu et al Radiotherapy & Oncology 2013

Median Survival = 11 months



Number at risk:

Upfront:	113	25	8	4	2
Salvage:	78	18	6	3	0

# Lesions treated...

Do we need to do more?

# WBRT?

- ◆ Seems to prevent recurrence and new progression
- ◆ But at what cost? Recognized negative cognitive impact.

# Prognosis of 12 months or more?

- ◆ Only Surgery/SRS and then close serial imaging observation

# Chemotherapeutic options

- ◆ Alk+ Non-small cell lung cancer
- ◆ Crizotinib
- ◆ 5 cases of good response- durability?





# Expectation of aggressive intervention of metastatic brain lesions?

- ♦ *I expect to cure the brain of malignancy.....*