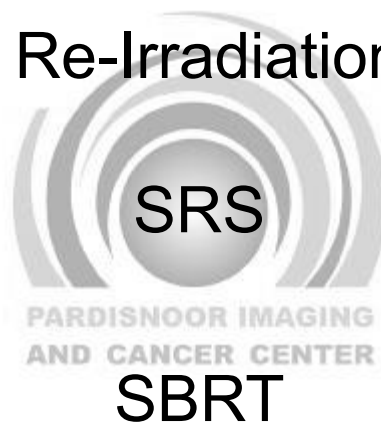


# Complex treatments Physician perspective

Sara Samiee MD FRCPC  
Radiation Oncologist  
PARDISNOOR IMAGING  
AND CANCER CENTER

## Re-Irradiation



# Re-Irradiation

- Never think it's impossible
- Review the dose distribution slice by slice
- Balance risks of treatment and its potential benefit
- Always think what will happen if you do nothing
- In many cases systemic tx is sentence to death

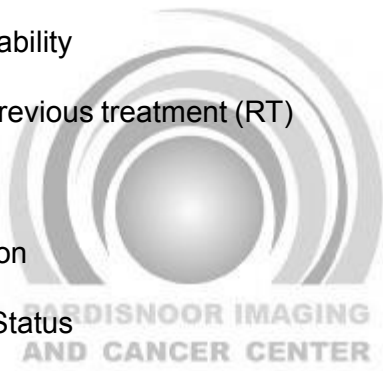
# The Process

- Assess the patient fully. Like always.
- Seek for every detail you can acquire.
  - Detail of the current tumour.
    - Try your best to get the volume as small as reasonably possible.
      - MRI - PET - CT - Ph/E
  - Details of previous plan.
    - **Fight for it! :)**



# Analyze the information

- Chance of curability
  - Time from previous treatment (RT)
    - $\geq 1$  year
- Dissemination
- Performance Status
- Review other options/ tx
- Informed Consent



## Information Analysis

Time from Previous RT < 2 years	<input checked="" type="checkbox"/>
Good Performance Status	<input checked="" type="checkbox"/>
Relatively limited disease	<input checked="" type="checkbox"/>
Expertise and Technique	<input checked="" type="checkbox"/>

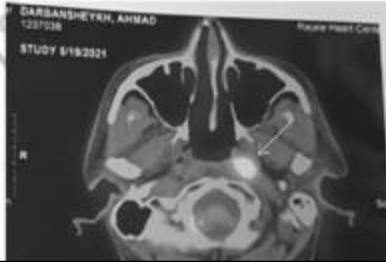


Review every slice of the previous plan.  
 Turn on/ draw/ calculate the important and key isodoses.  
 Key isodoses are those that can help you predict the rest of the plan.  
 Re-draw these isodoses or import them from the previous plan.  
 Start to think of your reasonable goals.

- Reasonable goal is a goal that is:
  - Feasible
  - Relatively safe
  - and Effective

# Case 1

- 55 year old Nasopharyngeal Ca
- Treated in Turkey
  - IMRT 70Gy to high dose volume
- Recurrence presented by otalgia 6 years post tx
  - Brachytherapy 25Gy in Tehran
- Symptoms better
- Stable disease in imaging
- Now referred for consult



**External Beam Planning**

Site	Structure	Structure Name	Charge (cGy)	Volume	Min. max	Max. min	Mean Dose	Max Dose	Min Dose	Max Dose	Min Dose	Max Dose	Min Dose	Max Dose	Min Dose	Max Dose
BS	Right Eye	Right Eye	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Left Eye	Left Eye	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Right Ear	Right Ear	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Left Ear	Left Ear	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Brain Stem	Brain Stem	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Spinal Cord	Spinal Cord	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Parotid Gland	Parotid Gland	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Salivary Gland	Salivary Gland	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Esophagus	Esophagus	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Trachea	Trachea	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Lung	Lung	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Heart	Heart	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Stomach	Stomach	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Small Intestine	Small Intestine	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Large Intestine	Large Intestine	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Bladder	Bladder	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum	Rectum	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Penis	Penis	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Vagina	Vagina	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Uterus	Uterus	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Ovary	Ovary	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Testis	Testis	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Prostate	Prostate	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Bladder Neck	Bladder Neck	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Uterine Cervix	Uterine Cervix	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Vagina Cervix	Vagina Cervix	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectal Sigmoid	Rectal Sigmoid	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum Sigmoid	Rectum Sigmoid	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum	Rectum	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum Sigmoid	Rectum Sigmoid	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum	Rectum	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum Sigmoid	Rectum Sigmoid	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum	Rectum	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum Sigmoid	Rectum Sigmoid	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum	Rectum	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum Sigmoid	Rectum Sigmoid	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
BS	Rectum	Rectum	50.0	10.0	0.0	100.0	50.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0

May - 2013 Turkey

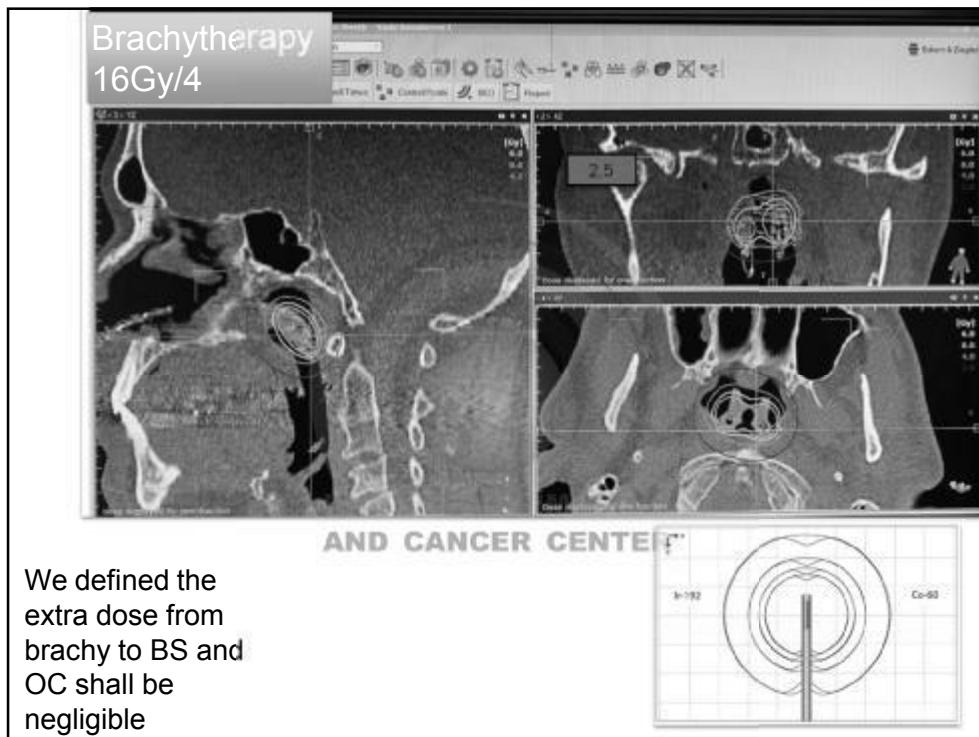
**External Beam Planning**

Plan Name: External Beam  
 Plan Beam: 6 MV  
 Plan Beam Energy: 100 kVp  
 Plan Beam Filter: 2.5 mm Al  
 Plan Beam Source: Varian TrueBeam  
 Plan Beam Output: 0.88 cGy/MU at 100 cm  
 Plan Beam Monitor Units: 53.22  
 Plan Beam Date: 2022-07-28 10:00:00 AM  
 Plan Beam Author: Ahmad Darsan Shirki  
 Plan Beam Reviewer: Ahmad Darsan Shirki

**Cumulative Dose Volume Histogram**


Ratio of Total Structure Volume [%]

• **Max points:**  
 • **BS: 53.22**  
 • **OC: 53.39**




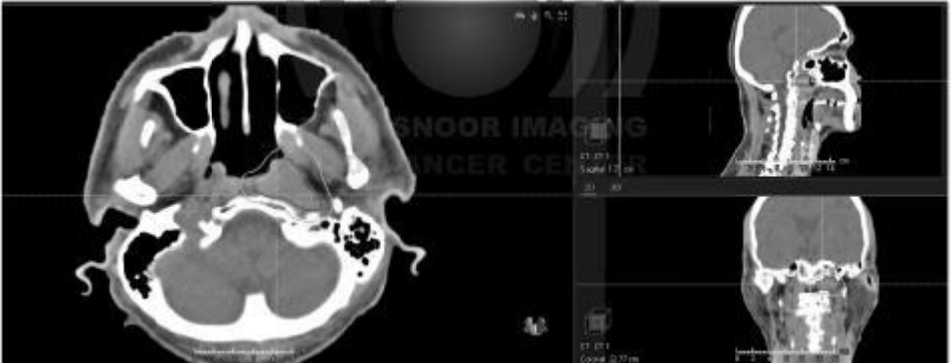
### My thought and questions:

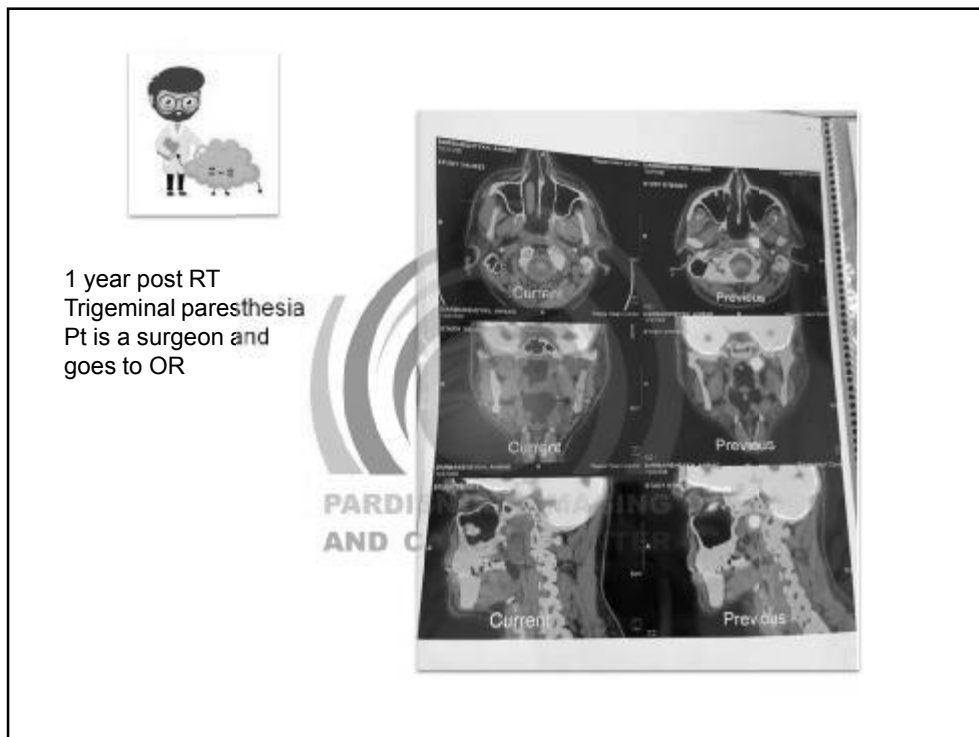
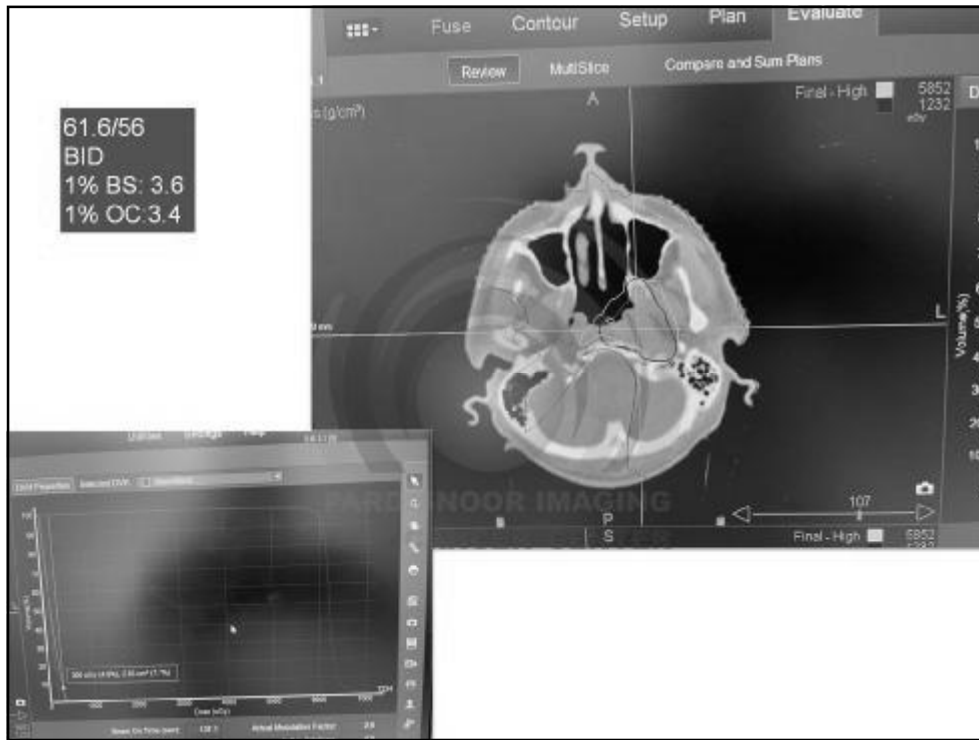
- Does this patient have another curative option?
  - 1.Surgery? Chemo? **No**
- Does this patient have an active disease or is it an adjuvant setting?
  - This is an active mass**
- If I have to use RT, what dose do I need to be reasonably effective?
  - >60Gy min**
  - Go by numbers**
- Based on the data I have, how possible is to cover a reasonable volume of the GTV with a reasonable dose?
  - Fatal necrosis and bleeding - BS, OC, SC damage**
- What would be the detorious risk ?
  - ~100%**
- What happens if I do nothing?
  - Death**
  - ~20%**

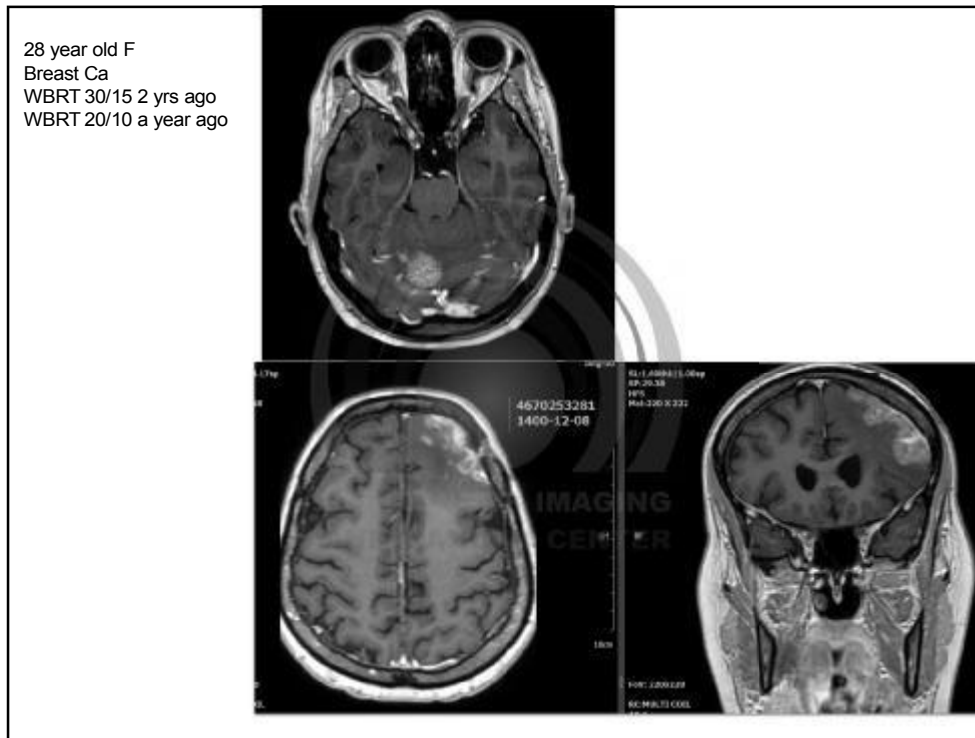


GTV  
 Small CTV BS < 3  
 Small PTV SC < 3  
 No LN OC < 3

**Go by numbers**





1. Does this patient have another curative option?
  - 1.Surgery? Chemo? No and it's not curative already
2. Does this patient have an active disease or is it an adjuvant setting?
  - Active symptomatic dis
3. If I have to use RT, what dose do I need to be reasonably effective?
  - SRS/ pall dose
4. Based on the data I have, how possible is to cover a reasonable volume of the GTV with a reasonable dose?
  - I don't know!
5. What would be the detorious risk ?
  - ?<10%
6. What happens if I do nothing?
  - Neuro Signs and death 100%
  - Radiation Necrosis





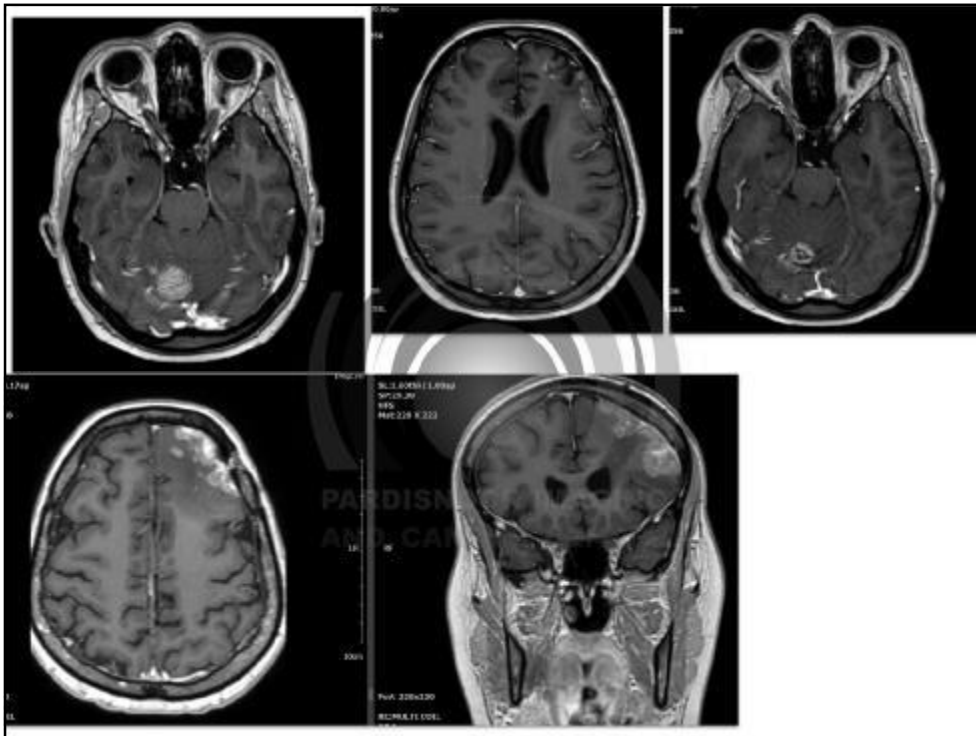
**PARDISNOOR IMAGING AND CANCER CENTER**

**SRS**

31.5/10  
V30 Brain = 10cc (<30cc)

28/5  
Max BS:8Gy

The image shows a screenshot of a medical imaging software interface, likely used for radiation therapy planning. The interface displays a 3D model of a patient's head and neck, along with various data panels and toolbars. The main window shows a cross-sectional view of the head. The interface includes a menu bar with 'Evaluate', 'Utilities', 'Settings', and 'Help'. A table of parameters is visible, including '2800 cGy is Fractions', 'Min Dose (Gy)', 'Max Dose (Gy)', and 'Max BS: 8Gy'. The text 'PARDISNOOR IMAGING AND CANCER CENTER' and 'SRS' is prominently displayed in the center. Below this, the text '31.5/10 V30 Brain = 10cc (<30cc)' and '28/5 Max BS:8Gy' is shown.



## Other cases:

- MM → Previous 50/20 to pelvis
  - Whole pelvic bone
- 8 year old girl → Medulloblastoma (CSI)
  - 1st recurrence
  - 2nd recurrence
    - Remission → Transplant
- 46 female, Pancreas Ca, → 45/25
  - T11 cord compression, SB < 4
- Maxillary sinus SCC
  - 35 years post, Max sinus SCC
- Hard palate and maxillary sinus SCC
  - two time treated each 30 sessions (30 years ago and 20 years ago )
  - Now upper lip and nasiolabial tumour with invasion into hard palate

# SRS

- Select the patient
- Previous WBRT?
- Number of lesions
- Distribution of lesions
- Proximity to thalamus, brainstem and chiasma
- Size
- Decide on coverage versus selectivity versus conformity

PARDISNOOR IMAGING  
AND CANCER CENTER

30/5

27/3

28/5

24/3

21/3

Target Coverage Ratio

$$\frac{PTV \ V_{100\%} \ (G-C)}{PTV} > 95\%$$

Selectivity Index

$$\frac{PTV \ V_{100\%} \ (G-C)}{\text{total} \ V_{100\%} \ (G-C)} > 0.95$$

Conformity Index

$$\frac{V_{20\%} \ (G-C)}{V_{100\%} \ (G-C)} < 1.25$$


Gradient Index

$$\frac{V_{20\%} \ (G-C)}{V_{100\%} \ (G-C)} < 1.25$$

Brain SRS

- Brainstem
- Optic pathways
- Thalamus
- Bone
- Skin / Hair

# Treatment days



- Daily
- Every other day
  - Within certain number of days
- 27/3 ( چهارشنبه -شنبه -دوشنبه )
  - 30/5 ( consecutive days - every other day )
  - 50/5 ( consecutive days - every other day )

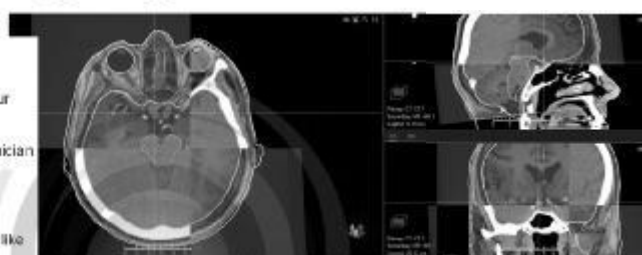
- Previous tx
- Proximity to OAR
- PS and cooperation
- Time of tx and hence your accuracy
- Simple vs Complex

Need to finish within certain days

2 weeks max

# Order Imaging

We always contour and register on axial images



- SRS Brain
  - Make an institutional based protocol for your MRI
    - Talk to your Radiologist/ Radiology technician
    - Understand your own limitation and capabilities
    - 3D MRI → know which view you would like to focus on
      - axial, coronal, sagittal
- Fusion
  - Do or review the fusion yourself diligently
    - Know the landmarks that need to be fused correctly
      - Is it OC, BS or both?
      - In Skull bone is very helpful but doesn't suffice
    - If you are in doubt ask.

Stereotactic tx are impressively effective treatments that can cure but can be also very dangerous if are performed with our enough caution and attention

# Order Imaging

- Lung
  - 4D MRI
    - Same homework (talk, ask, see, understand)
    - Respiratory gated
    - Fuse with CT
  - CT-sim
    - 1mm slices
    - Accessories
      - Stay with your team. Discuss. Know their issues. Be part of the team.



Your teammates are your extra eyes and ears for the sake of your patients good. If you let them and guide them to be so.

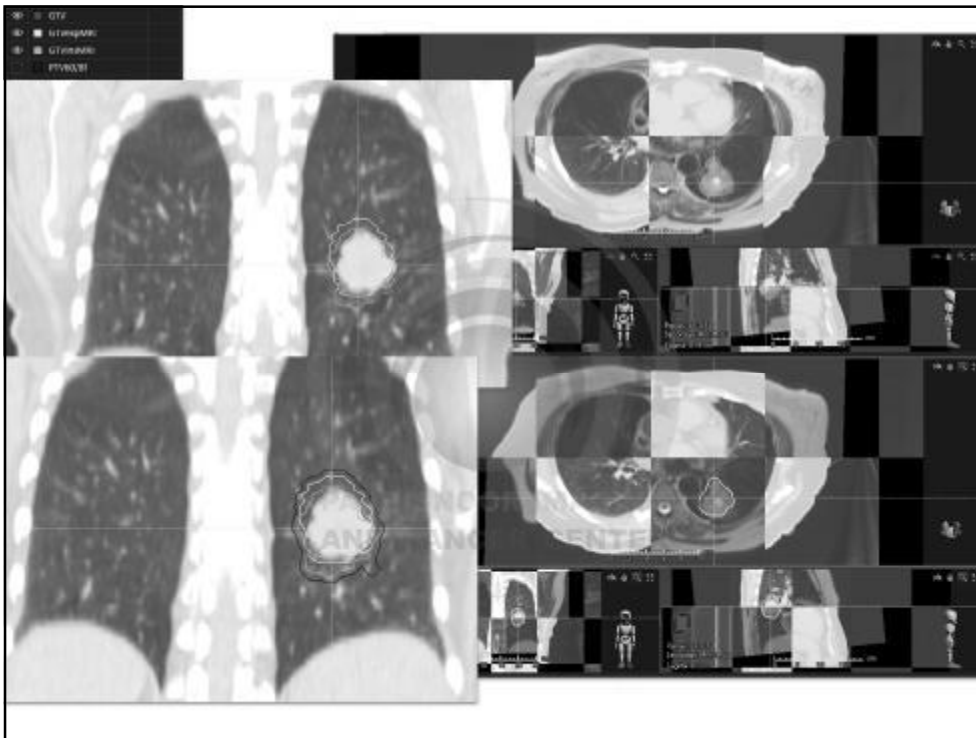
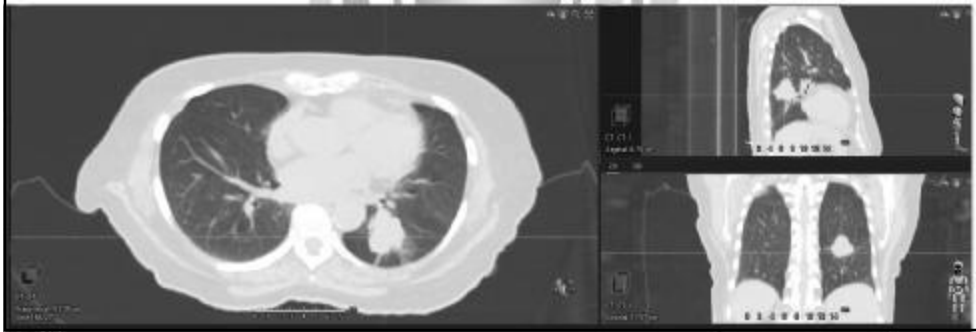
Team work doesn't mean your job is less daunting but you have to take responsibility to make sure that every single aspect of the plan is safe and sound

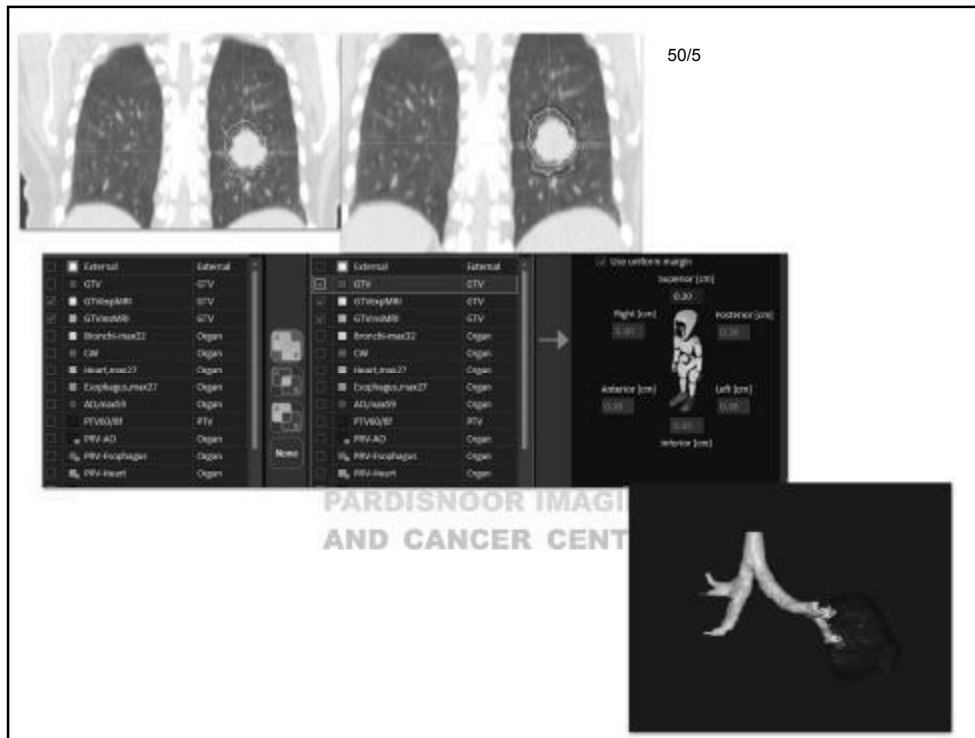
# Contours

- Goes with the basic rules
- Technically no CTV
- Treat what you see
- PTV, nil or quite small
  - That requires a robust immobilization
- OAR contouring is more important specially BS, OT, bronchial airway
  - Check back and forth with MRI

# A case on SBRT lung

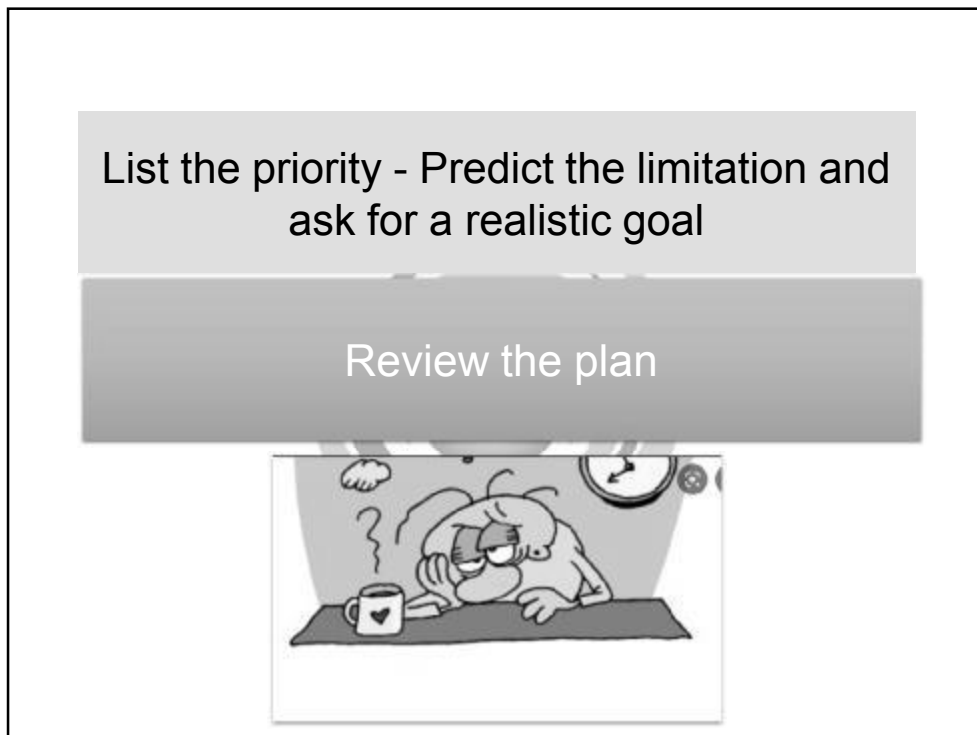
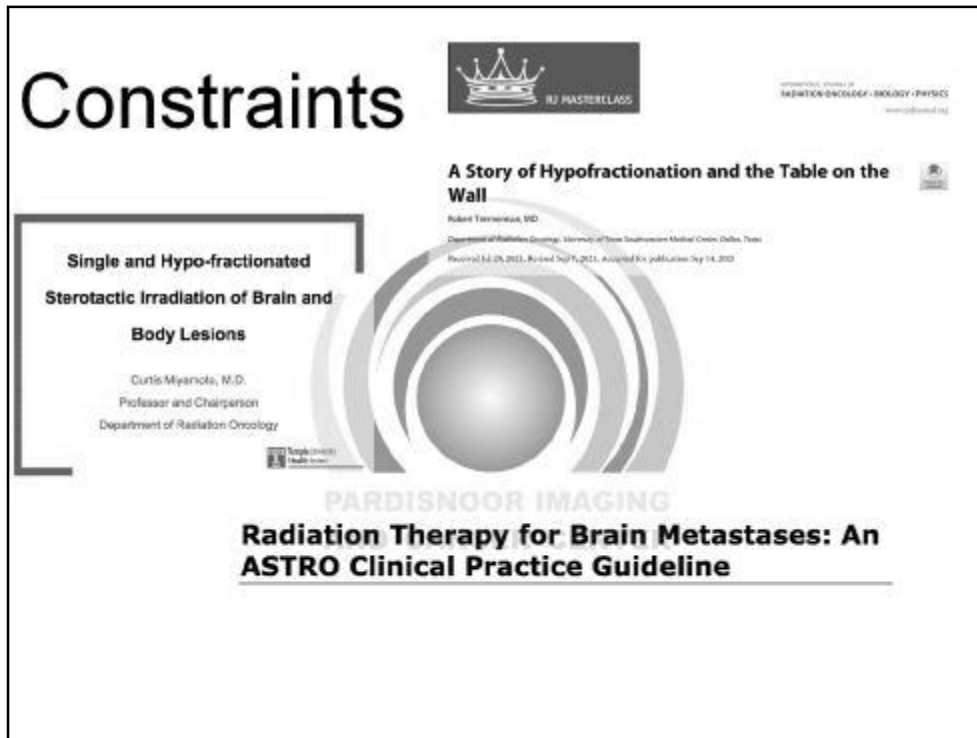
- A touch on contouring; SBRT Lung
- 75 year old with stage I NSCL Ca
- Essential thrombo-cytosis
  - Unfit for surgery or quite high risk
- SBRT is a standard treatment for stage I lung Ca when un-resectable, or refuse surgery





The image shows an axial CT scan of the chest on the left and a 3D model of the bronchial tree on the right. The 3D model highlights a specific target area within the central zone of the bronchial tree.

- Our target was within central zone
- Proximal bronchial airway
  - Shall be contoured one by one
- Chance of fistulae, hemoptysis and fatal hemorrhage goes up proportional to volume and dose





# Review a plan

• I always start from the end!

1. Numerical constraints

2. Coverage

1. By number

2. DVH

3. Check slice by slice

3. Hot area

1. OAR

2. PTV

4. Turn on asides 50% —> It tells you a lot of secrets about the plan



# Case Review

24/3  
Kept Normal BS < 18  
No PTV

• 56 year old male with lung ca diagnosed two years ago.

• EGFR +

• Bone met

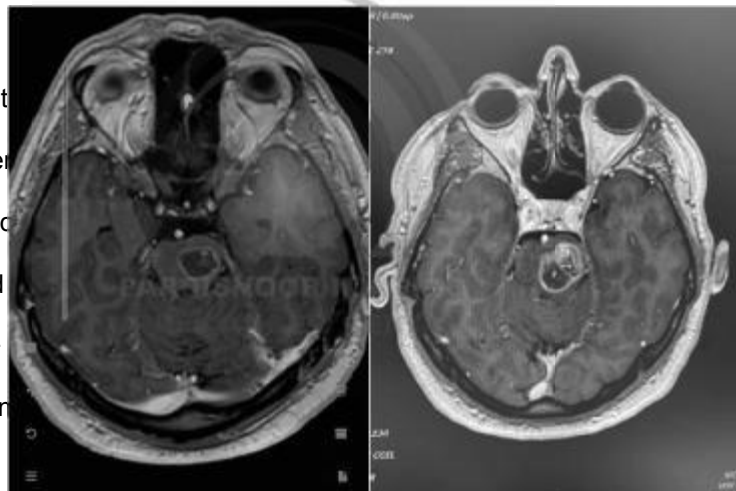
• On Systemic

• Consulted

• Reported

• Ph/E —>

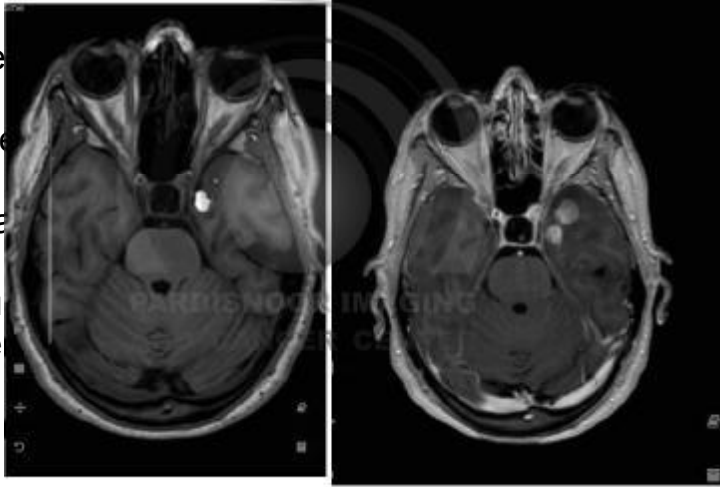
• MRI Brain



# Case Review

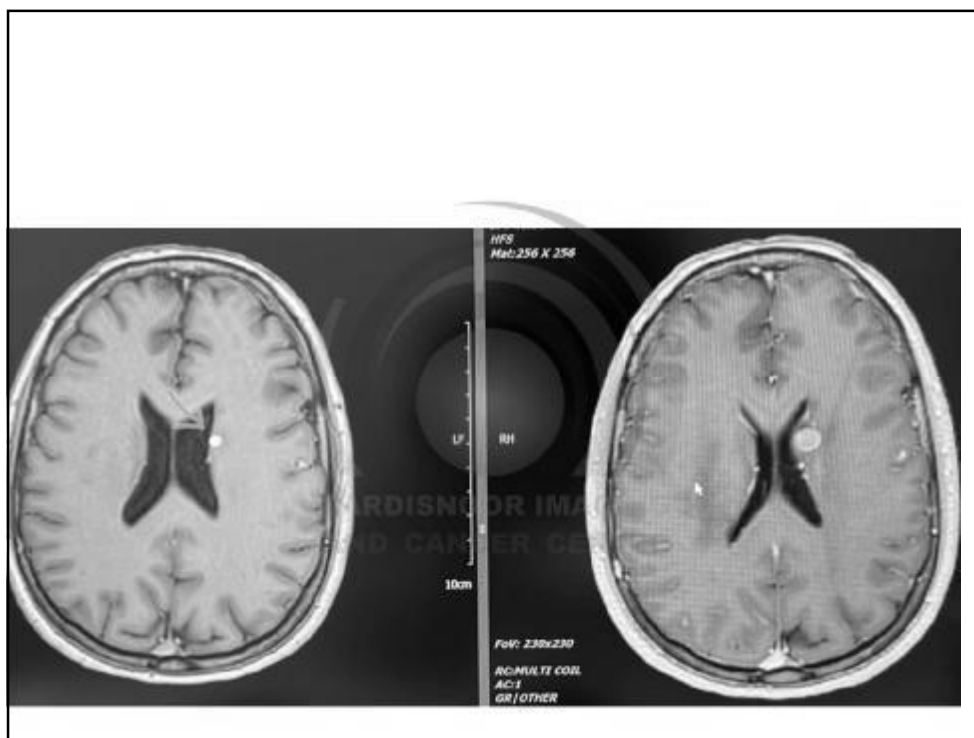
30/5  
Brain V12  
BS and OT

- 60 ye
- 12 me
- Prima
- Recu
- syste
- Only



The image displays two axial MRI brain scans. The left scan shows a hyperintense lesion in the posterior region, likely the occipital lobe. The right scan shows a similar view, possibly with a different sequence or contrast. The lesion is well-defined and appears to be a primary brain tumor.





## Questions?

