Wake Forest™
School of Medicine

Localizing RT Dose to Inform on Post-treatment Toxicities: Mood Disorders

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Research Base Annual Meeting 2013

Collaborators

Original Study Datasets

CCCWFU 97100 & 91105

- Students and Fellows
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- Staff Assistance
  - Constance Linville
  - Dosimetry Staff
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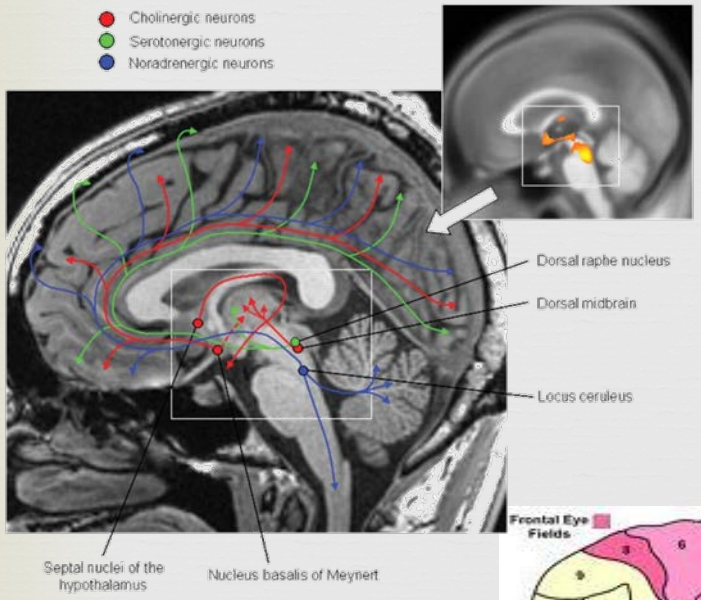
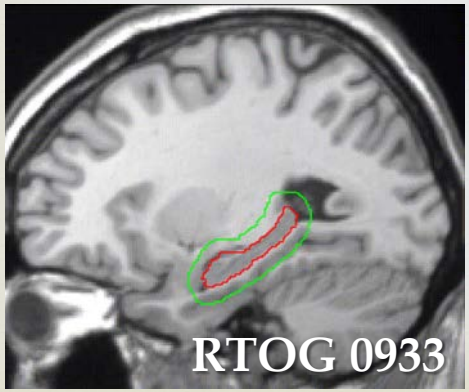
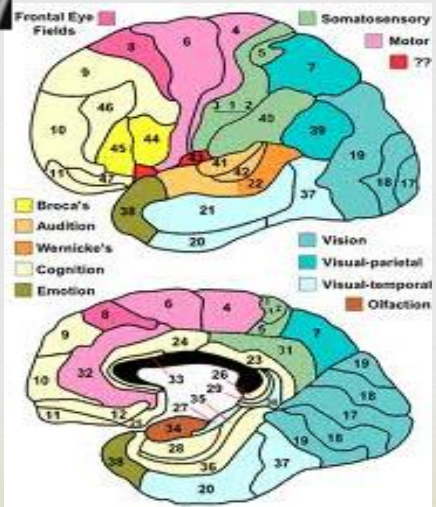
- Physics
  - Bill Kearns, MS
  - Bill Hinson, PhD
- Statistics
  - Ed Ip, PhD
  - Doug Case, PhD
- Psychiatry
  - Steve Rapp, PhD
- Radiation Biology
  - Mike Robbins, PhD
- Neuro-oncology
  - Steve Tatter, MD, PhD
  - Ed Shaw, MD, MA
  - Michael Chan, MD

- Funding
  - Medical Student Research Program, Argenta Scholarship Fund, Radiation Oncology Dept., OCCC, NIH CA113267, NR009675

All brain areas are not equal

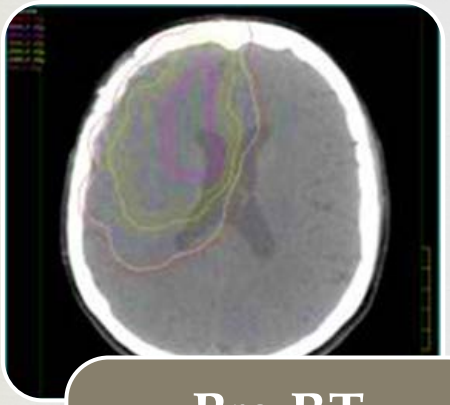






- Late-effect Toxicities
  - Develops >6 months
  - Not tied to necrosis
    - Stem cell depletion
    - Vascular damage
    - White matter damage
    - Cytokine, chemokine and signaling alterations
  - Cognitive, sensory and mood impacted

Data Collection Timeline

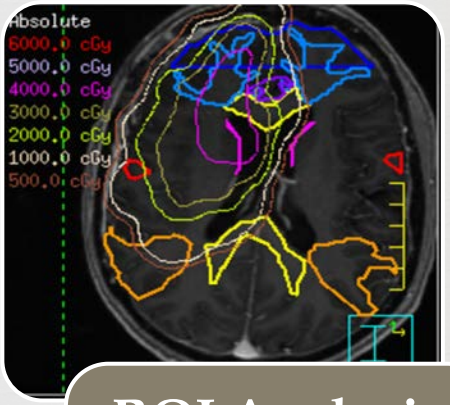


Pre-RT Planning

- MRI
- Isodose RT plan
- Follows resection surgery if needed

≥6mos Post-RT

- Enrolled in CCCWFU 91700 or 91105
  - Recent MRI shows no disease progression

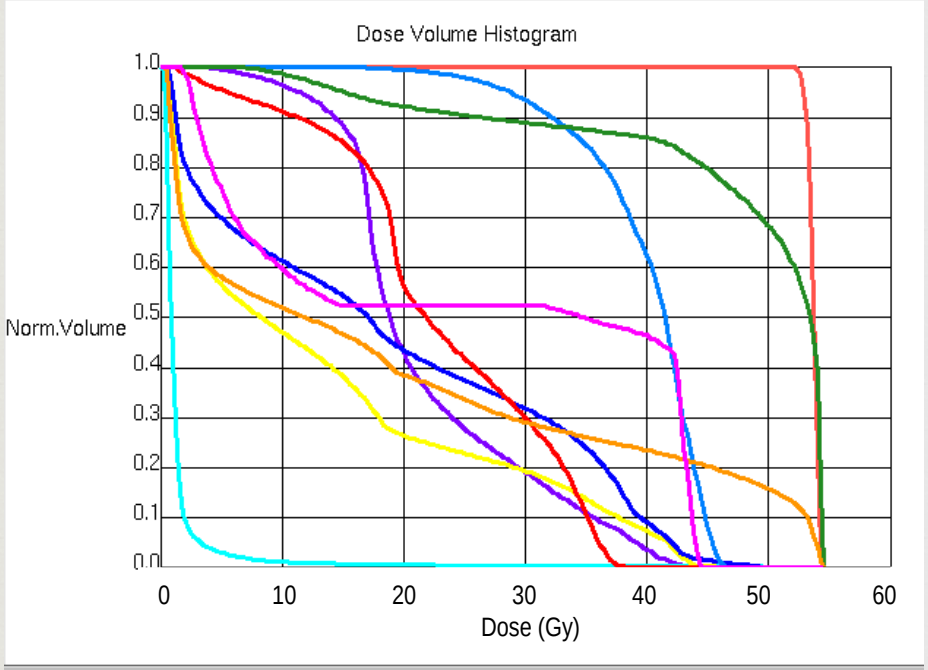


ROI Analysis

- % of ROI's Gy volume used to predict
- Included if:
  - Retrievable Partial RT plan

Gear Picture from http://www.elements4health.com/images/stories/conditions/brain-gears-2.jpg

Data taken from Dose Volume Histogram

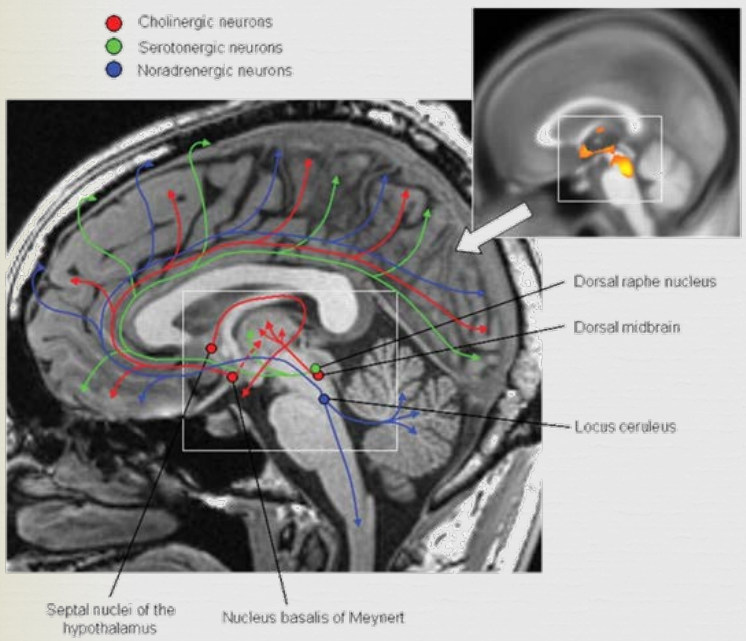


ROI Statistics

Line Type	ROI	Trial	Min.	Max.	Mean	Std. Dev.
	ant_cing_gyrus	**3-D	317.0	4470.7	2183.3	822.2
	cerebellum	**3-D	17.6	4939.0	133.3	224.4
	corpus_collosum	**3-D	46.4	4574.6	1360.9	1386.3

Gy	AC	CC	Tumor
5	0.99	0.56	1.00
10	0.96	0.47	1.00
20	0.43	0.26	1.00
30	0.19	0.19	1.00
40	0.03	0.07	1.00
50	0.00	0.00	1.00
60	0.00	0.00	0.00

DV: Profile of Mood States



- Average baseline, 12 & 24 weeks
- 42 available for analysis
  - Donepezil given to 45%
- Lt. Amygdala vol
  - Depression r^2 0.09, $p<0.05$, β-
- %vol of ROIs at 40Gy
  - Lt. Amygdala
    - Tension, Fatigue, Confusion, TMD
  - Rostral Brainstem
    - Confusion, TMD
  - Lt. Hippocampus
    - Confusion

r^2 0.09 - 0.16, $p<0.05$, β+

Summary

- Total brain dose does not predict post-tx function for partial brain treatment regimens

- Depending on outcome, different ROIs are important
  - Implications for a clinical trial's end point metrics
  - Similar to cognition, mood and quality of life metrics can be related to RT dose maps