

“HIGH-GRADE GLIOMAS: MULTIDISCIPLINARY APPROACH”

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Radiation Oncology



Radiology and Physical Medicine

KEY POINTS

Combination therapy improves the overall survival for Glioblastoma (GBM) patients compared to surgery alone (*)

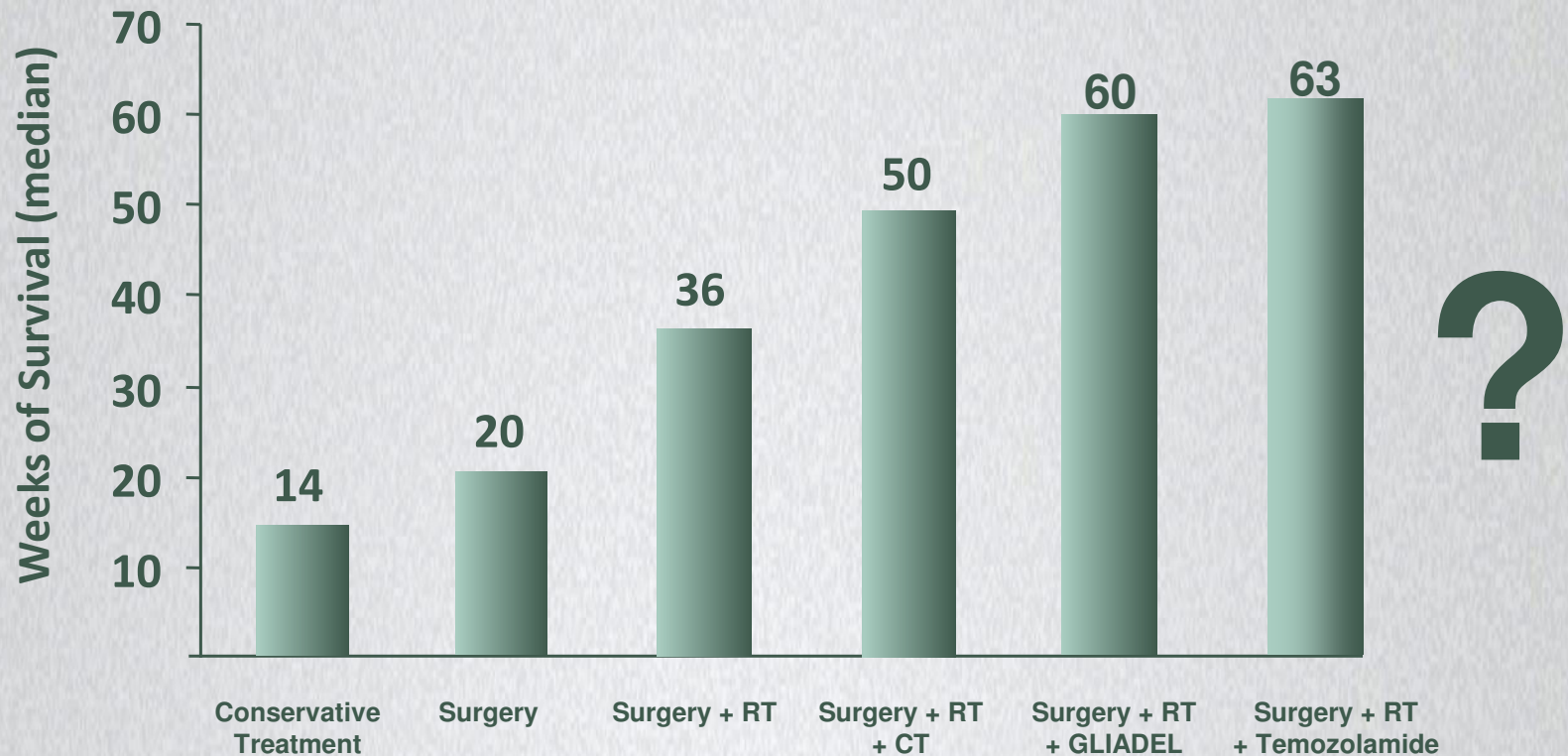
The GBM is refractory to treatment with survivals <2 years

- ✓ **Multidisciplinary Decision Making**
- ✓ **Technological Advances**
- ✓ **Combined Therapies**
- ✓ **Individualized treatments**

(*) Walker M, et al. Evaluation of BCNU and/or radiotherapy in the treatment of anaplastic gliomas. A cooperative clinical trial. *JNeurosurg*. 1978;49:333–343.



GBM TREATMENT EVOLUTION



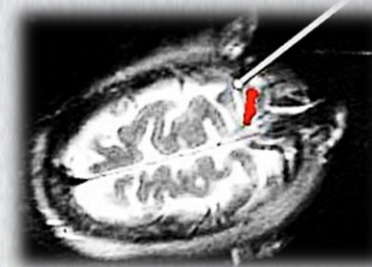
Adapted from: Patchell R. 1986; Mehta et al 1997; Chao et al 1994, RTOG 1989; Patchell 1990, Noordijk 1994; Patchell 1998, O'Neill et al 2003; Aoyama 2006; Shargavi et al 2001



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NEUROSURGERY

- ✓ **LASER Surgery**
- ✓ **Ultrasonic Aspiration**
- ✓ **Operating Microscope**
- ✓ **Endoscopy**
- ✓ **Neuronavigation (intravascular, functional...)**



- ✓ **Deep Brain Stimulation**
- ✓ **Stereotaxic Techniques**
- ✓ **Carmustine Implant**
- ✓ **Talairach's Grid**
- ✓ **5-AMINOLEVULINIC**
- ✓ **Brain surgery with the patient awake**



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NEURORADIOLOGY

Radiology

- ✓ Computed Tomography (CT) in the 70's
- ✓ Magnetic Resonance (MR) in the 80's
 - ✓ Gadolinium
 - ✓ Perfusion
 - ✓ Diffusion
 - ✓ Spectroscopy
 - ✓ 3 Tesla
 - ✓ Intraoperative MR

Nuclear Medicine

- ✓ SPECT
- ✓ PET



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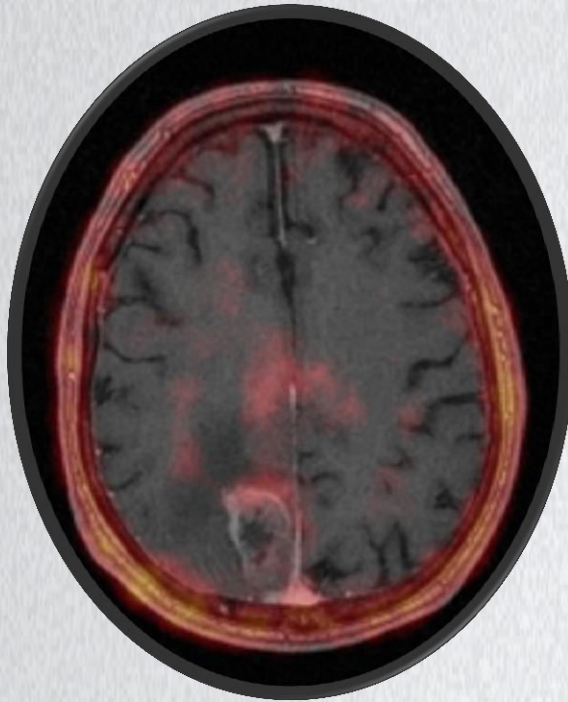
NUCLEAR MEDICINE ROLE

SPET / PET

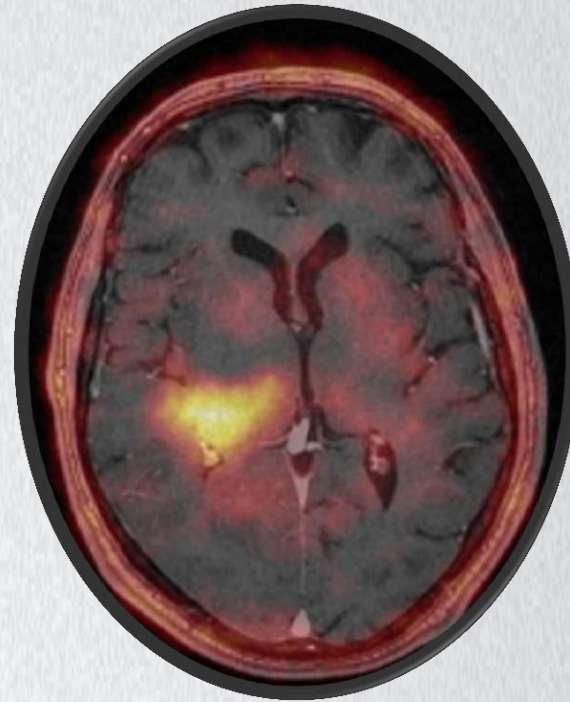
- ✓ The neurophysiological aspects are complementary to the structural image information (*Perry JR, 2003*)
- ✓ TI SPECT shows a low spatial resolution and image quality (*Minn H, 2005*)
- ✓ FDG-PET improves the spatial resolution and high specificity. But is limited by the uptake of glucose by the brain cortex (*Spaeth N, 2006*)



MR +
SPECT



SPECT
New Captation



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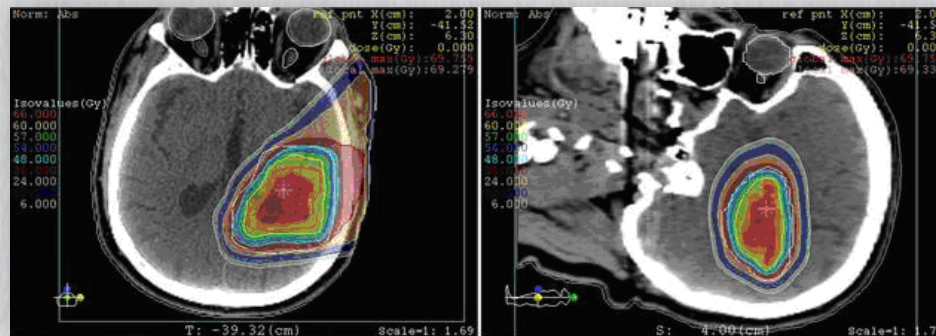
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IMRT / IGRT

Justification

- ✓ 80% of relapses are within 2-3 cm of the bed. Intensify dose may be an option
- ✓ Increasingly complex conformation PTV
- ✓ Avoid Risk Organs (optic organs, pituitary, trunk)



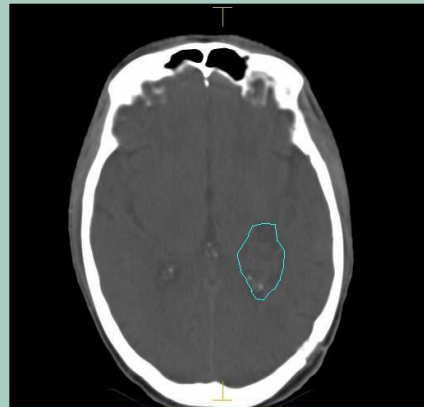
Glioma + Edema Delineation:

- ✓ With MR difficult because the tumor is not demarcated and the HEB is intact
- ✓ Enhanced dose precise gadolinium RM, spectroscopy, SPECT and/or PET

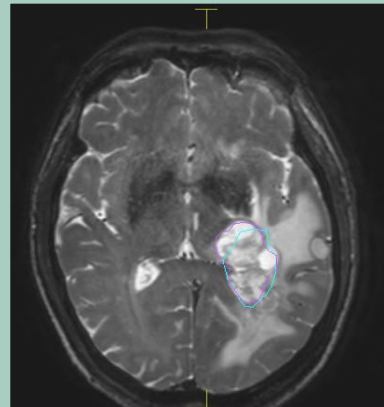


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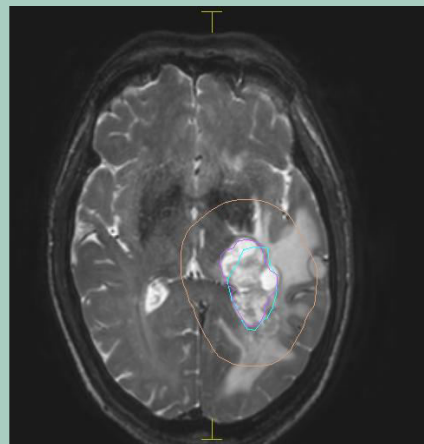
CT



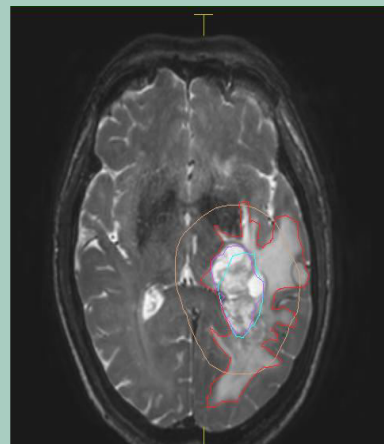
CT + MR



GTV + 2 cm
+ Edema



PTV =
GTV + 2
cm +
Edema



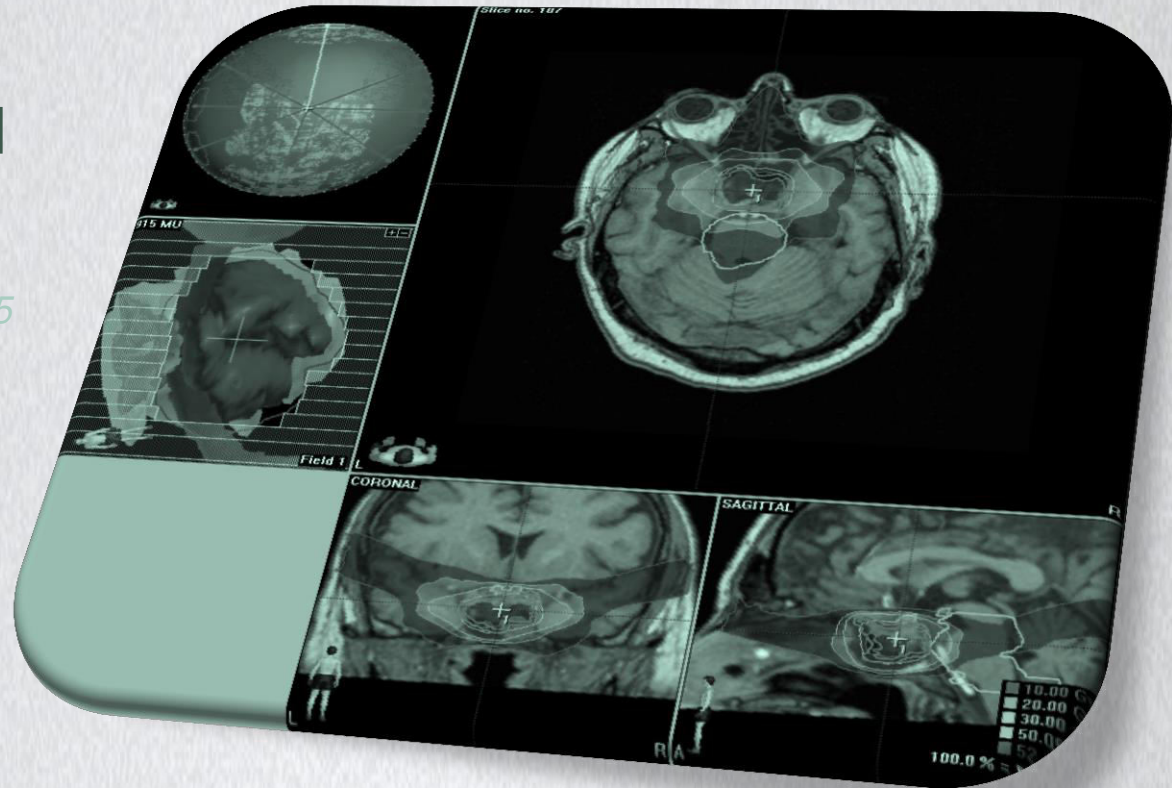
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SRS Y SFRT

“ASTRO
evidence-based
review”

Tsao MN, et al. IJROBP 2005



ITS ROLE HAS NOT BEEN DEMONSTRATED !



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- ✓ New advances (IMRT and VMAT) are not yet fully analyzed

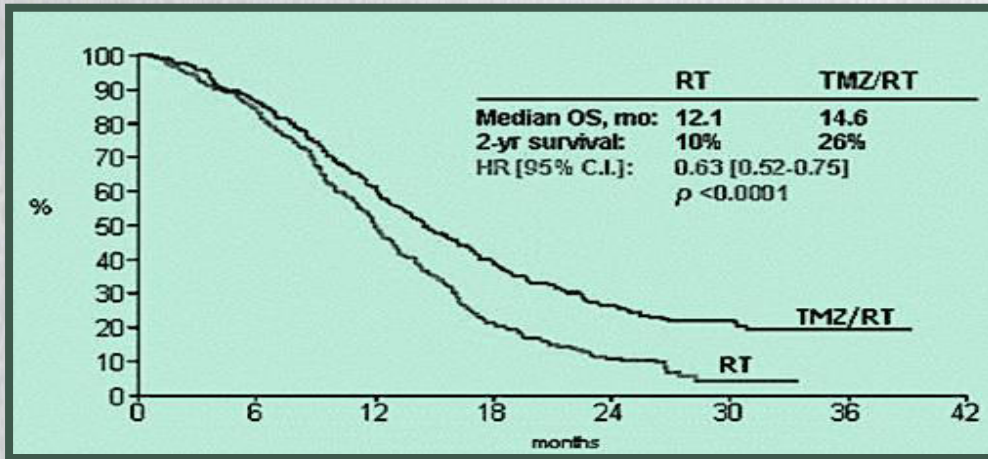
- ✓ EC are needed to establish dose fractionation and establish its role in:
 - Survival
 - Disease Progression
 - Neurocognitive Outcomes
 - Reduction of Toxicity
 - Quality of Life

- ✓ Stupp R, et al. Radiotherapy plus concomitant and adjuvant temozolomide for glioblastoma. N Engl J Med. 2005
 - 12.1 months median survival (60 Gy; 2 Gy/s;3D-RT)
 - 14. 6 months with 3D-RT + TMZ
 - IMRT or VMAT roles have to be established



MEDICAL ONCOLOGY

RT + Temozolamide



Stupp R, et al . 2005; Stupp R et al. 2009



Survival Benefit:

3 years --- 16%

4 years --- 12,1%

5 years --- 9,8%



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