

Surrogate Markers for Glioma Diagnosis: Diffusion Weighted Magnetic Resonance Imaging and Magnetic Resonance Spectroscopy

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References

- 1) Ross BD, Moffat BA, Lawrence TS, Mukherj SK, Gebarski SS, Quint DJ, Johnson TD, Junck L, Robertson PL, Muraszko KM, Dong Q, Meyer CR, Bland PH, McConville P, Hairong G, Rehemtulla A, Chenevert TL. Evaluation of Cancer Therapy Using Diffusion Magnetic Resonance Imaging., *Molecular Cancer Therapeutics* 2003;2:581-7.
- 2) Theilmann R, Borders R, Trouard TP, Xia G, Outwater E, Ranger-Moore J, Gillies RJ, Stopeck A. Changes in Water Mobility Measured by Diffusion MRI Predict Response of Metastatic Breast Cancer to Chemotherapy. *Neoplasia* 2004;6:831-7.
- 3) Chiaki Asao, Yukunori Korogi, Mika Kitajima, Toshinori Hirai, Yuji Baba, Keishi Makino, Masato Kochi, Shoji Morishita, and Yasuyuki Yamashita, Diffusion-Weighted Imaging of Radiation-Induced Brain Injury for Differentiation from Tumor Recurrence. *AJNR Am J Neuroradiol* 26:1455-1460, June/July 2005.
- 4) Qing-Shi Zeng, Ph.D.,* Chuan-Fu Li, M.D.,* Hong Liu, Ph.D., Jun-Hui Zhen, M.D., and De-Chao Feng, M.D. Distinction Between Recurrent Glioma and Radiation Injury Using Magnetic Resonance Spectroscopy in Combination With Diffusion-Weighted Imaging, *Int. J. Radiation Oncology Biol. Phys.*, Vol. 68, No. 1, pp. 151-158, 2007.
- 5) Barbara Fazeny-Dornera, Catharina Wenzela, Mario Veitlb, Maria Piribauera, Karl Rosslerc, Karin Dieckmannd, Karl Ungersbockc and Christine Marosia Survival and prognostic factors of patients with unresectable glioblastoma multiforme, *Anti-Cancer Drugs* 2003, 14:305-312.
- 6) Kaisorn L. Chaichana, Matthew J. McGirt, James Frazier, Frank Attenello, Hugo Guerrero-Cazares, Alfredo Quinones-Hinojosa. Relationship of glioblastoma multiforme to the lateral ventricles predicts survival following tumor resection, *J Neurooncol* (2008) 89:219-224.

- 7) P. Weybright, P. Maly, D. Gomez-Hassan, C. Blaesing, P. C. Sundgren. MR spectroscopy in the evaluation of recurrent contrast-enhancing lesions in the posterior fossa after tumor treatment. *Neuroradiology* (2004) 46: 541-549.
- 8) Lars A. Ewell, Christopher J. Watchman, Kurt Wharton, Sulci density map to aid in use of apparent diffusion coefficient for therapy evaluation. *Magnetic Resonance Imaging* 26 (2008) 20-25.
- 9) Patrick Therasse, Susan G. Arbuck, Elizabeth A. Eisenhauer, Jantien Wanders, Richard S. Kaplan, Larry Rubinstein, Jaap Verweij, Martine Van Glabbeke, Allan T. van Oosterom, Michaele C. Christian, Steve G. Gwyther. New Guidelines to Evaluate the Response to Treatment in Solid Tumors, *Journal of the National Cancer Institute*, Vol. 92, No. 3, February 2, 2000.
- 10) Young G, *Advanced MRI of Adult Brain Tumors*, *Neurol Clin* 25 (2007) 947-973.
- 11) Macdonald D, Cascino T, Schold SC and Cairncross JG, Response Criteria for Phase II Studies of Supratentorial Malignant Glioma, *Journal of Clinical Oncology*, Vol 8, No 7 (July), 1990: pp 1277-1280.
- 12) Marc C. Chamberlain, Pseudoprogression in Glioblastoma, *JOURNAL OF CLINICAL ONCOLOGY*, VOLUME 26 - NUMBER 26 - SEPTEMBER 10 2008.
- 13) Ashok J. Kumar, Norman E. Leeds, Gregory N. Fuller, Pamela Van Tassel, Moshe H. Maor, Raymond E. Sawaya, Victor A. Levin, Malignant Gliomas: MR Imaging Spectrum of Radiation Therapy- and Chemotherapy-induced Necrosis of the Brain after Treatment. *Radiology* 2000; 217:377-384 .
- 14) Haacke, Brown, Thompson and Venkatesan, *Magnetic Resonance Imaging*, 1999, John Wiley and Sons, Inc., 605 Third Ave., NY, NY 10158-0012.
- 15) Moffat et al., 'Functional diffusion map: A noninvasive MRI biomarker for early stratification of clinical brain tumor response', *Proc. Nat. Ac. Sci.* pp. 5524-5529, 102 no. 15, April 12, 2005.
- 16) Skare S, Rexford D. Newbould, Clayton D, Albers G, Nagle S, Bammer R. Clinical Multishot DW-EPI Through Parallel Imaging With Considerations of Susceptibility, Motion, and Noise., *Magnetic Resonance in Medicine* 57:881-890 (2007).
- 17) Sarlls J, Newbould R, Altbach M, Gmitro A, Seeger J, Trouard T. Isotropic Diffusion Weighting in Radial Fast Spin-Echo Magnetic Resonance Imaging. *Magnetic Resonance in Medicine* 53:1347-1354 (2005).
- 18) Firbank M, Coulthard A, Harrison R, Williams E. A Comparison of Two Methods for

- Measuring the Signal to Noise Ratio on MR Images. *Phys. Med. Biol.* 44 (1999) N261.N264.
- 19) Vijayakumar N, Ewell L. Relationship of Uncertainty in Pixel Intensity to Apparent Diffusion Coefficient Calculation. *SU-FF-I-77, Medical Physics* 34(6), 2355, June 2007.
- 20) Bevington P. *Data Reduction and Error Analysis for the Physical Sciences*. New York: McGraw-Hill Inc, 1969.
- 21) Wallner et al., 'Patterns of Failure Following Treatment for Glioblastoma Multiforme and Anaplastic Astrocytoma', *International Journal of Radiation Oncology and Biology and Physics*, 16, 1405-1409 1989.
- 22) Hall E. J., 'Radiobiology for the Radiologist', Fifth Edition, Lippincott Williams and Wilkins, Philadelphia, PA 2000.
- 23) Motulsky H., 'Intuitive Biostatistics', Oxford University Press, 1995, 198 Madison Avenue, New York, New York, 10016.