Prognostic Value of Initial Magnetic Resonance Imaging Growth Rates for World Health Organization Grade II Glioma

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Objective

To determine if MRI-based measurement of growth rate prior to treatment has prognostic value in grade II gliomas.

Methods

- 143 consecutive patients diagnosed between 1992-2004
- Older than 17 years of age
- Absence of contrast enhancement
- Astrocytoma, oligodendroglioma, or mixed glioma
- At least 2 MRI studies pre-treatment, at least 3 months apart

Results

- Patient characteristics
  - Median age 34
  - Symptoms at dx: 7 patients asymptomatic, 124 patients with seizures, 12 patients with headache, 7 patients with neurologic deficits
  - Median tumor volume 74.5 cm 3: 54 patients had histologic diagnosis via biopsy, 34 patients had partial resections, 40 had subtotal resections, and 15 had total resections
  - 92 oligodendrogliomas, 24 astrocytomas, 27 mixed histology
  - Median Ki-97 proliferation index 5% (72% of cases were assessable)
- Radiology
  - Median of 3 tumor measurements prior to treatment
  - Median duration of repeat measurements was 21.7 months
  - Median Individual Radiological Growth Rate (IGR) 4.4 mm/year
  - Two Groups: 121 <8mm/year à low risk (LR) and 22 >8mm/year à high risk (HR)
  - No significant difference between the 2 groups regarding various demographics and treatment factors except that more biopsies done in LR group
- Survival
  - Median clinical follow-up after radiologic diagnosis was 6.5 years
  - 18.1% of LR patients died during this time versus 45.5% in HR group; median time to death was 6.7 years in LR group and 4.9 years in HR group
  - Median survival was 5.16 years in HR group versus 15 years in LR group
  - Univariate Analysis: inverse correlation between IGR and survival ($p<0.001$); histology, tumor volume, age, neurologic deficits, and Ki-67 proliferation score not significant predictors of survival
  - Multivariate Analysis: IGR ($p<0.0001$) and tumor volume ($p=0.034$) were independent prognostic factors for survival

Discussion

- IGR measurements prior to treatment in supratentorial grade II gliomas are predictive of prognosis
  - Previous studies have shown age >40, astrocytoma histology, tumor diameter >6 cm, neurologic defects, and lesions crossing midline have worse prognosis.
  - Lack of significance for several other prognostic factors may be due to small sample size.
- Limitations of histologic diagnosis
  - Limited because it is "static"
  - Limited to part of the tumor, particularly in biopsies or partial resections
  - Conversely, tumor growth rate a macroscopic, dynamic parameter
  - In tumors growing >8 mm/year, worse prognosis despite absence of anaplastic transformation à seem to behave more like anaplastic gliomas with median survival of 5.16 years
- Study may be limited as 2 MRIs may not accurately determine growth velocity