Surgery for convexity meningioma: Simpson grade I resection should still be the goal

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Introduction

Treatment of meningiomas has for decades been radical resection. In 1957, Simpson published his hallmark paper showing a significant correlation between degree of meningioma resection and tumor recurrence (1). Several later studies have found that both WHO grade and Simpson resection grade are important prognostic factors for tumor recurrence and survival (2,3). However, recently the relevance of Simpsons resection grade as a prognostic factor for recurrence of WHO grade I meningiomas was challenged, contradicting many previous scientific reports and traditional neurosurgical teaching (4).

The main objective was to study whether the predictive value of Simpson resection grade with respect to meningioma recurrence and overall survival is outdated or still valid.

Methods

All patients =16 years who underwent primary craniotomies for convexity meningiomas at the Oslo University affiliated hospitals (Rikshospitalet and Ullevål University Hospital) in the period 01.01.1990 – 27.01.2011 were included. Overall survival (OS) and retreatment-free survival (RFS) rates were related to patient- and surgery-specific factors.

Statistics

Univariate statistics were calculated without assuming a gaussian distribution using Wilcoxons test when the variable was continous. With categorical variables univariate statistics were calculated using Pearsons chi-squared test. In ordinal variables the proportional odds likelihood test was used. Survival curves were generated using the Kaplan Meier estimator. The logrank test was used to compare different survival curves.

The Simpson scale was investigated for simplification first non-parametrically by utilizing a recursive partioning analysis (RPA) and subsequently parametrically utilizing multiple Cox-model comparisons. The RPA searches all possible splits between the variable values seeking to maximise an information measure difference between the two nodes yielding a tree. The parametric analysis was done estimating the Cox proportional hazard model incorporating all five levels of the Simpson scale (full model). Subsequently, we dichotomized the Simpson grade in different categories and performed cox regression on these models. Finally, we created a model comparing grade 1, grade 2 and grade 3-5. The Akaike information criterion (AIC) is presented as a measure of model fit and represents the trade-off between accuracy and model complexity. R 2.13.0 was used for all statistics. A p-value less than 0.05 was considered significant.

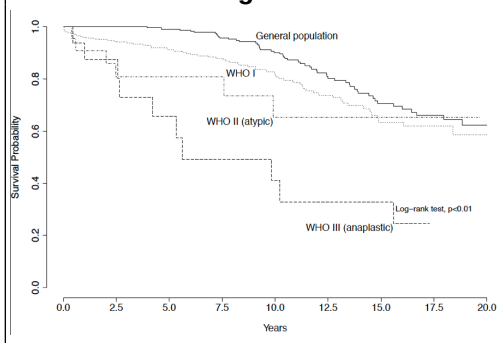
Results

Included in the study were 391 consecutive patients. Median age was 60.1 years (range 19 - 92). Female-to-male ratio was 2.1:1. WHO grade was grade I in 352 (90.3%), grade II in 22 (5.6%) and grade III in 16 (4.1%). Follow-up was 100%. Median follow-up time was 7.1 years (range 0.0 – 20.9 years) and total observation time was 3147 patient-years.

Overall survival

The 1-, 5- and 10-year OS were 96%, 89% and 78%, respectively (Fig. 1). Age, gender, WHO-grade and Simpson grade were significantly associated with OS.

Figure 1

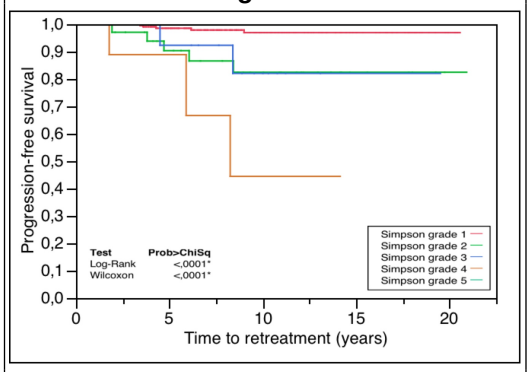


Overall survival stratified by WHO grade

Retreatment-free survival

The 1-, 5- and 10-year RFS were 99%%, 94% and 90%, respectively. Simpson resection grade and WHO grade were significantly associated with RFS. Odds ratio for retreatment after Simpson resection grade 2/3 and 4/5 were 5.2 and 26.1 times higher than after Simpson grade 1 resection, respectively (Fig. 2).

Figure 2



Retreatment-free survival stratified by Simpson grade

Conclusions

Simpson grade 1 resection should still be the goal for convexity meningiomas.

References

1.Simpson D: The recurrence of intracranial meningiomas after surgical treatment. J Neurol Neurosurg Psychiatry 20:22-39, 1957

2.Jaaskelainen J, Haltia M, Servo A: Atypical and anaplastic meningiomas: radiology, surgery, radiotherapy, and outcome. Surg Neurol 25:233-242, 1986

3.Morokoff AP, Zauberman J, Black PM: Surgery for convexity meningiomas. Neurosurgery 63:427-433; discussion 433-424, 2008

4.Sughrue ME, Kane AJ, Shangari G, Rutkowski MJ, McDermott MW, Berger MS, et al: The relevance of Simpson Grade I and II resection in modern neurosurgical treatment of World Health Organization Grade I meningiomas. J Neurosurg 113:1029-1035, 2010