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Growth rates of intracranial meningiomas: A volumetric analysis

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Purpose: Aim of this study was to determine the natural history of asymptomatic and subtotally resected intracranial meningiomas and its relation to radiological appearance and histological features.

Method: In 41 patients with asymptomatic meningiomas and 36 patients after subtotal resection, the hospital charts, follow up records and imaging studies were reviewed. The tumor growth rates were determined by calculating the absolute and relative growth rates and the tumor volume doubling times.

Results: In the group of asymptomatic meningiomas the absolute growth rate ranged from 0,03 – 2,62 cm³/year (mean 0,796 cm³/year). Relative annual growth rates ranged from 0,48-72,8% with a mean rate of 14,6%. The tumor doubling time ranged from 1,27-143,5 years with a mean of 21,6 years. A moderate correlation between the age and growth rates was found. In young patients annual growth rates tend to be higher and tumor doubling times shorter. There was no clear correlation between the initial tumor size and tumor doubling time. The mean annual growth rate of meningiomas with calcification was lower than in tumors without calcification. Also tumors with hypo- or isointense T2-signals on MRI had a lower growth rate. In the group with subtotal removal of tumor with histologically verified grade 1 meningiomas (n=33) the absolute growth rate ranged from 0,005 – 8,77 cm³/year (mean 2,19 cm³/year), relative annual growth rates from 0,28 – 121,8% (mean 27,1%) and the tumor doubling time from 0,87 – 242,7 years with a mean of 19,7 years. In atypical meningiomas (WHO grade 2) absolute and relative growth rates were significantly higher and tumor doubling times shorter. Mib-1 labelling indices do not strictly correlate with tumor growth rates.

Conclusions: The majority of incidental meningiomas show minimal growth thus they may be observed without surgical intervention unless specific symptoms appear. The tumor growth is associated with the age of the patients. The initial tumor size is not considered as a predictive factor for tumor growth. Radiological features like calcification or T2-signal intensity may provide useful information to predict the growth potential of meningiomas. In subtotally removed meningiomas (grade 1 WHO) the growth rates were slightly higher and tumor doubling times shorter compared to asymptomatic meningiomas. Atypical meningiomas show significantly higher growth rates. Mib-1 labelling index alone does not always predict the growth potential of meningiomas.