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Growth dynamics of untreated glioblastomas in vivo

Anne Line Stensjøen, Ole Solheim, Kjell Arne Kvistad, Asta K. Håberg, Øyvind Salvesen, and Erik Magnus Berntsen

Department of Circulation and Medical Imaging, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway (A.L.S, E.M.B.); Department of Neurosurgery, St. Olavs University Hospital, Trondheim, Norway (O.S.); National Competence Centre for Ultrasound and Image Guided Therapy, St. Olavs University Hospital, Trondheim, Norway (O.S.); Department of Neuroscience, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway (O.S, A.K.H.); Department of Radiology, St. Olavs University Hospital, Trondheim, Norway (K.A.K, A.K.H., E.M.B.); Department of Cancer Research and Molecular Medicine, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway (Ø.S.)

Corresponding Author: Anne Line Stensjøen, Medical research student, MR Center, Department of Circulation and Medical Imaging, Faculty of Medicine, Norwegian University of Science and Technology, Post Box 8905, N-7491 Trondheim, Norway (stensjoe@stud.ntnu.no).

See the editorial by Badve and Sloan, on pages 1307–1308.

Background. Glioblastomas are primary malignant brain tumors with a dismal prognosis. Knowledge of growth rates and underlying growth dynamics is useful for understanding basic tumor biology, developing realistic tumor models, and planning treatment logistics.

Methods. By using repeated pretreatment contrast-enhanced T_1-weighted MRI scans from 106 patients (aged 26–83 years), we studied the growth dynamics of untreated glioblastomas in vivo. Growth rates were calculated as specific growth rates and equivalent volume doubling times. The fit of different possible growth models was assessed using maximum likelihood estimations.

Results. There were large variations in growth rates between patients. The median specific growth rate of the tumors was 1.4% per day, and the equivalent volume doubling time was 49.6 days. Exploring 3 different tumor growth models showed similar statistical fit for a Gompertzian growth model and a linear radial growth model and worse fit for an exponential growth model. However, large tumors had significantly lower growth rates than smaller tumors, supporting the assumption that glioblastomas reach a plateau phase and thus exhibit Gompertzian growth.

Conclusion. Based on the fast growth rate of glioblastoma shown in this study, it is evident that poor treatment logistics will influence tumor size before surgery and can cause significant regrowth before adjuvant treatment. Since there is a known association between tumor volume, extent of surgical resection, and response to adjuvant therapy, it is likely that waiting times play a role in patient outcomes.

Keywords: brain neoplasms/pathology*, cell growth processes, glioblastoma, growth dynamics, magnetic resonance imaging.

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Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
	1 Tumor Discovered	2	3	4 Jo's Doctor Tells Dennis Tumor Is Operable	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24 Jo's Friends Had To Take Jo To Her First Appt. With Neurosurgeon	25	26	27
28	29	30 Dennis Finally Takes Jo To Neurosurgeon	31	Notes: Dr. Ashby advises that the tumor has now spread too far and is no longer in an operable state.		