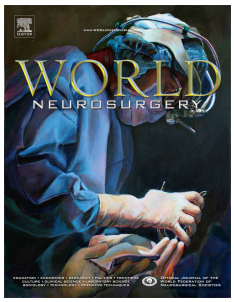
Journal Pre-proof



On the question of prognosis in cystic gliomas

Allan J. Drapkin, MD, Clinical Assistant Professor

PII: S1878-8750(25)01072-1

DOI: https://doi.org/10.1016/j.wneu.2025.124714

Reference: WNEU 124714

To appear in: *World Neurosurgery*

Received Date: 1 December 2025

Accepted Date: 4 December 2025

Please cite this article as: Drapkin AJ, On the question of prognosis in cystic gliomas, *World Neurosurgery* (2026), doi: https://doi.org/10.1016/j.wneu.2025.124714.

On the question of prognosis in cystic gliomas.

Allan J. Drapkin MD

Clinical Assistant Professor.

Department of Neurosurgery.

Rutgers Medical and Health Sciences University.

Newark, New Jersey. USA 07102

Ajdrapkin@gmail.com

ORCID ID# 0000-0002-7930-1548

On the question of prognosis in cystic gliomas.

Allan J. Drapkin MD

Clinical Assistant Professor.

Department of Neurosurgery.

Rutgers Medical and Health Sciences University.

Newark, New Jersey. USA 07102

Ajdrapkin@gmail.com

ORCID ID# 0000-0002-7930-1548

KEY WORDS: Glioma-cyst-Pascal-Fluids-Prognosis-Hypothesis

INTRODUCTION

Gliomas are a heterogenous group of intra-axial neuroepithelial tumors that account for more than 50% of all intracranial tumors. About one third of these, regardless of their degree of malignancy, develop within them, large cysts containing clear fluid and sometimes present occasionally a mural nodule.

Currently, an ongoing discussion exists about whether the prognosis of cystic gliomas is better than the one for solid ones of identical neuropathology[1]. Past experience has supported the idea that such a beneficial effect exists[2,3,4]but, never the less, more recent clinical studies on this topic have yielded only conflicting results with no definitive conclusion [5,6,7,8,9]. The purpose herewith is to approach that subject from a novel perspective, based on fluid mechanics, considering that this prognostic difference (if one indeed exists), could be related to hydrostatic factors[10] rather than to biological ones.

The fundamental rule in hydraulic physics is based on Pascal law (Pascal B.1663) which states that "any pressure change applied to any section of the external wall of a *rigid* container holding within it an incompressible fluid collection at rest, would be transmitted with the same intensity centripetally into that fluid collection in all directions without loss.". It should be known that, for Pascal, the concept of incompressible fluid, relates both to liquids as well as to gases.

From a medical perspective, survival for any medical condition is the time lapse extending from the point in time when the diagnosis of a disease is made, until the patient´s death. From a mathematical point of view, survival time is calculated by dividing the overall survival of a population after the diagnosis of a specific disease is made, by the survival of a similar population without that disease. Based on this, the earlier the diagnosis of a disease is made, the longer the survival time would be, implying a better prognosis.

In the case of a solid intra-axial mass lesion, the symptoms caused by it, would depend on a number of the added factors such as the tumor´s size and its surrounding edema, its cerebral location, the possible effect it may have upon neighboring vascular structures, its potential

to cause an increase in intracranial pressure and the local pressure effect that all these factors together might have upon the brain tissue involved, affecting the local tissue pressure. The situation is different in the case of a cystic intra-axial mass lesion, were the container´s wall is *pliable.* This circumstance enables the pulse pressures coming from the surrounding brain parenchyma (originating from the arterial pulse pressure within it) to penetrate through the cyst wall and extend into its contained fluid collection in all directions with the same intensity, conferring the cyst its spherical configuration. This cyst expansion force would also to project, in a reverse mode, from the fluid collection and through the pliable cyst wall, back into the surrounding brain tissue, thus becoming an *additional pressure factor* to increase the local tissue pressure in the affected parenchyma. Consequently, the time period required to reach the pressure level of symptom production in the affected area, would be shorter than in the case of a solid lesion, (where no *additional pressure* exists). This situation would result in an earlier clinical diagnosis than in the case of solid gliomas and a mathematically prolonged survival time, implying a better prognosis.

CONCLUSION

Under these circumstances, the clinical diagnosis of a cystic glioma, based on Pascal law[10], would be established sooner than it would be in the case of a solid one, resulting in a longer survival time with a better prognosis.

ADDITIONAL NOTE

The hydrostatic mechanism described above would be active, not only for cystic gliomas, but also for any other intra-axial cystic lesion, be it congenital, parasitic, infectious or tumoral.

ACKNOWLEGMENTS

The author would like to thank Miss Katherine Y. Donoso, Miss Camila G. Berner and Mr. Samuel Abogabir S. for their invaluable assistance in the writing of this article.

REFERENCES

1. Russell DS, Rubinstein LJ (1971): Pathology of tumors of the nervous system. London: Edw Arnold.
2. Drapkin AJ, Behar AJ, Beller AJ (1973): Cystic glioma of the cerebral hemispheres, with long survival. Acta Neuropath (Berl) 26:353-356.
3. Palma L, Russo A, Mercuri S (1983): Cystic cerebral astrocytomas in infancy and childhood: Long term results. Child´s Brain 10:79-9.
4. Soffer D, Sahar A (1982): Cystic glioma of the brainstem with prolonged survival. Neurosurgery 10(4):499-502.
5. Kaur G, Bloch O, Jian B, Kaur R, Sughrue E et al (2011): A critical evaluation of cystic features in primary glioblastoma as a prognostic factor for survival. J. Neurosurg. 115:754-759.

6. Lee Curtin P, Whitmire CR, Rickertsen et al (2021): Assessment of prognostic value of cystic features in glioblastoma relative to sex and treatment with standard of care. Front Oncol 16 10:580750.

7. Maldaum MVC, Suki D, Frederick F, Lang et al (2011): Cystic glioblastoma. Survival outcome features in primary glioblastoma as a prognostic factor for survival. J. Neurosurg. 115:754-759.

8. Sae-Huang M, Smith LC, Usher C, Scotthill C (2022): Cystic glioblastomas: a systematic review and meta-analysis of characteristics and outcomes. doi:10.1016/j.bas.2022.101692.

9. Utsuki S, Oka H, Suzuki, Tanisaki Y, Kondo K, Tanaka S, Kawano N, Fujü K (2006): Pathological and clinical features of cystic and non-cystic glioblastomas. Brain Tumor Pathology 23(1):29-34.

10. Pascal B (1663): The physical treatises of Pascal: The equilibrium of liquids and the weight of the mass of the air. Trans. AGH Spiers and IHB Spiers. New York: Columbia University Press.

INVITED PERSPECTIVE

Title: On the question of prognosis in cystic gliomas.

Allan J. Drapkin MD
Clinical Assistant Professor.
Department of Neurosurgery.
Rutgers Medical and Health Sciences University.
Newark, New Jersey. USA 07102
Ajdrapkin@gmail.com
ORCID ID# 0000-0002-7930-1548

NO DISCLOSURES OR CONFLICTS OF INTEREST