



article of the month

The Effects of Anesthetics on Glioma Progression: A Narrative

Kristen Gray, Rafi Avitsian, Saranya Kakumanu, Lashmi Venkatraghavan, Tumul Chowdhury

J Neurosurg Anesthesiol. 2022 Apr 1;34(2):168-175. doi: 10.1097/ANA.0000000000000718.

Welcome to the June of Article of the Month. After a great start of summer, this month we discuss the following article: The Effects of Anesthetics on Glioma Progression: A Narrative Review Commentary by authors of this article Dr. Kristen Gray and Dr. Tumul Chowdhury. Dr. Tamul Chowdhury should not be a stranger to anyone who frequently reads the AOTM as he is a frequent contributor to this project.

As always, we encourage our readers' input on this topic on the SNACC [Twitter](#) feed, or on [Facebook](#).

Dr. Kristen Gray- Biographical sketch

Dr. Kristen Gray is currently pursuing anesthesia residency at University of Manitoba, Winnipeg, Manitoba, Canada. As a first-year resident, her interests within Anesthesia remain broad and include regional anesthesia, neuroanesthesia, and critical care.

Dr. Tumul Chowdhury - Biographical sketch

Dr. Chowdhury is a staff anesthesiologist at Toronto Western Hospital and clinician investigator at University Health Network, Toronto. He is the Vice chair of Neuroanesthesiology Section of Canadian Anesthesiologists' Society. He holds the secretary and treasurer position at Brain and Heart Interactions Society. He serves as an assistant editor of the SNACC newsletter, as well as member of Training Engagement Committee and Clinical affair committees. He is a member of Neuroanesthesia Program Relations Committee of ICPNT. He has an extensive track record of publications. He is an editor of two books, and authored several book chapters. His research interests include impact of anesthetics on brain cancer survival/progression, heart and brain interactions, trigeminal cardiac reflex and ischemic stroke.

Commentary

Kristen Gray MD (Resident-PGY1)-Department of Anesthesiology, Pain and Perioperative Medicine, Health Sciences Center, University of Manitoba, Winnipeg, Manitoba, Canada

Tumul Chowdhury MD, DM, FRCPC (Staff Anesthesiologist)
Department of Anesthesiology and Pain Medicine, Toronto Western Hospital University Health Network, University of Toronto, Toronto, ON, Canada

This review paper by Gray et al. focuses on the effects of propofol and the inhaled agents (desflurane, isoflurane and sevoflurane) on high grade glioma progression. They predicted that studies would demonstrate a survival benefit from using propofol as an anesthetic during glioma resection, as there is a substantial amount of data establishing the survival benefit of propofol compared to the volatile agents in non-brain cancer patients, details of which are also included in this review¹. The effects of these anesthetics on *in vitro* glioma cells as well as on glioma disease progression have only recently begun to be investigated, and the findings are compelling and could inform future neuroanesthetic practices.

The authors conducted a narrative review of the literature using PubMed and Embase, which ultimately yielded 14 articles. Most of these papers investigated the effects of propofol versus volatile anesthetics on *in vitro* glioma cell activity, while only two studies looked at human populations, and they were retrospective in nature. All the *in vitro* studies demonstrated that propofol had cytotoxic effects on glioma cells, with various mechanisms described including stimulation of ROS formation, modulation of glutamate release, and miRNA up-regulation. Findings related to the volatile agents were variable; most researchers found that they stimulated the glioma cells, though several found them to be inhibitory. The papers investigating glioma progression and patient survival were contradictory: one demonstrated that propofol had a survival benefit for a specific subgroup of frail patients, whereas the second did not demonstrate any survival benefit. Given the lack of available research on the subject, the inconclusive literature review is unsurprising.

The authors go on to extrapolate the data surrounding *in vitro* glioma cells and non-brain cell cancer survival, which is in support of propofol as a superior agent with respect to cancer outcomes, to glioma patients. They posit that awake craniotomy for glioma resection, which is typically done under a total intravenous anesthetic with propofol, could yield a survival benefit for patients beyond its other numerous established advantages. These advantages include improved ability to avoid eloquent brain areas, attenuation of the surgical stress response, and less perioperative opioids used^{2,3,4}. While most craniotomies are currently done under a general anesthetic, the carefully dissected findings of this review suggest considerable morbidity and mortality benefits of awake craniotomy, some already established and some to be further explored. Currently a lack of available research prohibits the authors from proposing that total intravenous anesthesia with propofol and awake craniotomy would benefit patients with glioma in terms of cancer progression. However, as interest in this fascinating area of neuroanesthesia grows and more research is conducted, and the authors suspect that a survival benefit of total intravenous anesthesia with propofol for glioma surgery will soon be recognized.

References

1. Yap A, Lopez-Olivo MA, Dubowitz J, Hiller J, Riedel B, Group the GO-ARC. Anesthetic technique and cancer outcomes: a meta-analysis of total intravenous versus volatile anesthesia. *Can J Anesth Can d'anesthésie*. 2019;66(5):546-561. doi:10.1007/s12630-019-01330-x
2. Gupta DK, Chandra PS, Ojha BK, Sharma BS, Mahapatra AK, Mehta VS. Awake craniotomy versus surgery under general anesthesia for resection of intrinsic lesions of eloquent cortex—A prospective randomised study. *Clin Neurol Neurosurg*. 2007;109(4):335-343. doi:10.1016/j.clineuro.2007.01.008
3. Cassinello F, Prieto I, del Olmo M, Rivas S, Strichartz Professor of Anesthesia GR. Cancer surgery: how may anesthesia influence outcome? 2015. doi:10.1016/j.jclinane.2015.02.007
4. Aich A, Gupta P, Gupta K. Could Perioperative Opioid Use Increase the Risk of Cancer Progression and Metastases? *Int Anesthesiol Clin*. 2016;54(4):e1-e16. doi:10.1097/AIA.0000000000000112