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Addressing Postdural Puncture Headache: Guiding Clinicians Through Diagnosis and Management

Dibash Kumar Das, PhD Pamela Flood, MD, MA

Postdural puncture headache (PDPH) is a well-recognized complication resulting from a dural puncture during epidural analgesia, spinal anesthesia, or other neuraxial interventions. The incidence of unintended dural puncture during placement of an epidural catheter ranges widely, from less than 1% to approximately 40%, based upon procedural and patient factors (*Reg Anesth Pain Med* August 2023; *JAMA Netw Open* 2023;6:e2325387). PDPH typically presents within five days

postpuncture with clinical features that include headache, neck stiffness, hearing symptoms, and visual disturbances, among others (*Reg Anesth Pain Med* August 2023; *JAMA Netw Open* 2023;6:e2325387; asamonitor.pub/3U0KPcE). These symptoms are due to low cerebrospinal fluid (CSF) pressure from leakage (*Reg Anesth Pain Med* August 2023; *JAMA Netw Open* 2023;6:e2325387; *Cephalalgia* 2018;38:1-211).

While some headaches subside within two weeks, particularly those from small-gauge

needle punctures, their severity can significantly disrupt daily activities, especially for postpartum patients caring for newborns (*Reg Anesth Pain Med* August 2023; *JAMA Netw Open* 2023;6:e2325387). Severe complications can include chronic headache, backache, subdural hematoma, and cerebral venous sinus thrombosis (*Reg Anesth Pain Med* August 2023; *JAMA Netw Open* 2023;6:e2325387).

Postdural puncture headaches caused by large epidural needles typically do not

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ASA Community: The Meeting Place for Today's Informed Anesthesiologist

George Tewfik, MD, MBA, FASA, CPE, MSBA

ASA Community is an invaluable tool available to all of ASA's more than 57,000 members. It is a member-exclusive online discussion forum that often reflects the most important issues of the day pertaining to the daily practice of anesthesiology. On a normal weekday, about 12,000 people

read the community's daily digest email, and the forum website averages 10,000 page views a week. In 2023, there were more than 500 new discussion threads that covered topics ranging from quantitative train-of-four monitoring and medications that may affect climate change, to

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Advancing Perioperative Brain Health: Insights from ANESTHESIOLOGY® 2023 Abstracts

Donna Ron, MD Stacie Deiner, MD, MS Daniel J. Cole, MD, FASA

The ANESTHESIOLOGY® annual meeting acts as a conduit for pioneering research, with several abstracts presented in 2023 that shed light on different aspects of perioperative brain health. Four thought-provoking abstracts are synthesized below and in the Figure. These abstracts not only offer novel insights into preoperative cognitive assessments, machine learning applications, and benzodiazepine use, but also lay the

groundwork for potential advancements in predicting and preventing postoperative cognitive complications.

Preoperative self-screening cognitive test for postoperative delirium risk

Dr. Kotaro Gunji and colleagues from Shimane University Hospital in Japan presented their abstract examining the utility

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SPECIAL SECTION

Global Critical Care 15-23

Guest Editor: Ana Maria Crawford, MD, MSc, FASA

Your Patient's Brain: Insights from ANESTHESIOLOGY® 2023 Abstracts

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of a preoperative cognitive self-screening test for the assessment of postoperative delirium (POD) risk (asamonitor.pub/4aQkR1e). Recognizing the lack of a universally accepted standardized test to diagnose cognitive decline preoperatively, the researchers implemented a preoperative self-screening cognitive test using a touchscreen (MSP-1100, Nihon Kohden, Tokyo, Japan). The retrospective analysis of data from older patients undergoing invasive surgery revealed a statistically significant association between low scores and an increased incidence of POD.

Out of the 89 patients evaluated, 42.7% developed POD. Of note, only 3.4% had a preexisting diagnosis of dementia, but the self-screening test identified 16.8% of patients as being in the low-score group, indicative of cognitive decline. The low-score group exhibited a significantly higher incidence of POD (80%) compared to the high-score group (35%). The sensitivity and specificity of the screening test were 31.6% and 94.1%, respectively.

“These four studies all examine strategies for risk assessment and prevention of postoperative adverse neurologic outcomes, with three focusing on POD and the fourth on POCD. Each of the studies focuses on a different model for risk assessment, highlighting the continuing drive for tools for risk stratification specific to brain health outcomes.”

While the self-administration of the cognitive screening makes it appealing in environments with staffing challenges, these results raise pertinent questions about the efficacy of self-screening tests in predicting POD. Although the specificity of 94.1% is noteworthy, the modest sensitivity underscores the complexity of comprehensive risk stratification for POD.

Machine learning models for predicting postoperative delirium

An abstract by Shelly Teng and Dr. Ira Hofer from the Icahn School of Medicine

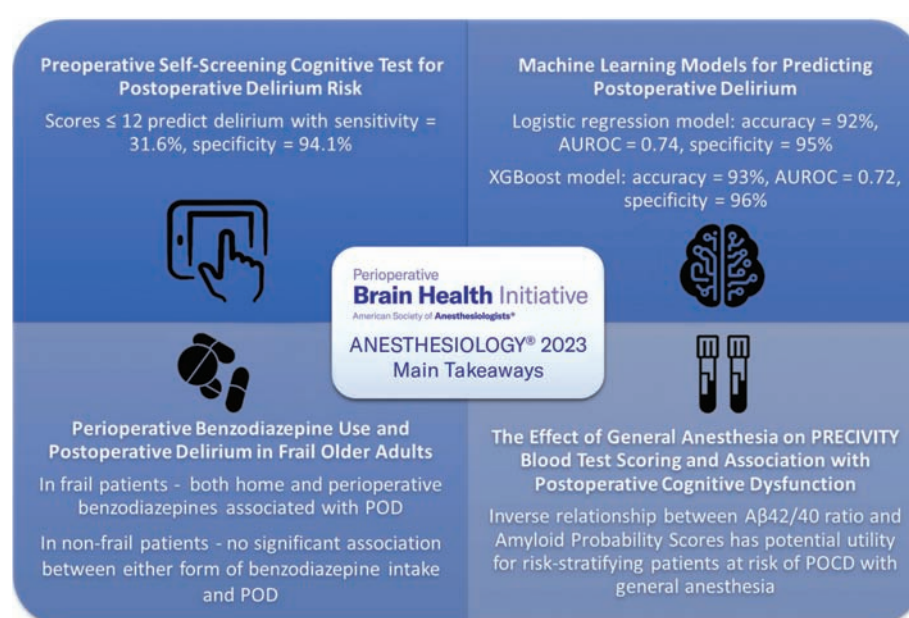


Figure: Main perioperative brain health takeaways from 2023 abstracts

at Mount Sinai delved into the realm of machine learning models for predicting POD (asamonitor.pub/3NWKi7M). This approach has the appeal of utilizing data already available in the electronic health record (EHR) for risk stratification, potentially obviating the need for the administration of a specific screening test. Using a dataset of over 26,000 patients, logistic regression and XGBoost models demonstrated promising accuracy and specificity. Patient age, surgery length, body mass index, and preoperative vital sign data emerged as essential contributors to predictive performance, underscoring the potential of machine learning as a scalable tool.

Improving our ability to predict POD helps target the highest-risk patients for implementation of the more resource-intensive preventive measures. The reliance on EHR data prompts considerations about data quality and the need for robust validation in various clinical settings.

Perioperative benzodiazepine use and postoperative delirium in frail older adults

A prospective observational study from the David Geffen School of Medicine at UCLA, authored by Howard Hong and colleagues, explored the nuanced relationship between perioperative benzodiazepine use and POD, particularly in frail older adults (asamonitor.pub/48JJRWWh). The study aimed to determine whether patients with frailty are at increased risk of POD with perioperative benzodiazepine use, compared with non-frail patients. In addition, the association between chronic preoperative benzodiazepine use and POD was examined.

Interestingly, the study did not find an association between perioperative benzodiazepine use and POD among non-frail patients. In contrast, among frail patients, both perioperative and home benzodiazepine use was associated with POD.

However, only 3% of patients on chronic benzodiazepines had received perioperative benzodiazepines. The authors suggest that abstinence from benzodiazepines may be a contributing factor to POD among chronic users. An additional concerning finding was the relatively high prevalence of chronic benzodiazepine use among frail patients (26%), putting these patients at increased risk of cognitive impairment, delirium, falls, fractures, and other complications (*J Am Geriatr Soc* 2019;67:674-94).

These findings highlight the importance of POD prevention for frail individuals and prompt further investigation into the mechanisms underlying benzodiazepine-associated POD, in addition to potential interventions such as tapering home use of benzodiazepines before surgery.

Effect of general anesthesia on PRECIVITY blood test scoring and association with postoperative cognitive dysfunction

Drs. Giovanna Patafio and George L. Tewfik at Rutgers-New Jersey Medical School sought to explore the PRECIVITY β -amyloid blood test's association with postoperative cognitive dysfunction (POCD) (asamonitor.pub/47A21sI). Through the preoperative and postoperative measurement of A β 42/40 ratios and calculation of Amyloid Probability Scores, the study introduces a potential biomarker for predisposition to cognitive decline. The rationale for the use of a blood test for β -amyloid protein to predict POCD was based on prior data showing an association between inhaled anesthetics and increases in β -amyloid levels in rats, in addition to the strong correlation between β -amyloid levels and cognitive decline (*PLoS One* 2017;12:e0175654; *J Alzheimers Dis* 2019;69:169-78). Although the researchers were ultimately unable to assess for POCD due to limited staffing, the identified inverse relationship between



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the A β 42/40 ratio and Amyloid Probability Score invites further mechanistic exploration into the role of beta-amyloid in postoperative cognitive outcomes.

Despite study limitations, the PRECIVITY test may have potential as a tool to screen patients for POCD risk. Further research is warranted to assess long-term correlations with POCD and explore the test's predictive capabilities in a larger patient cohort.

Synthesis and implications

These four studies all examine strategies for risk assessment and prevention of postoperative adverse neurologic outcomes, with three focusing on POD and the fourth on POCD. Each of the studies focuses on a different model for risk assessment, highlighting the continuing drive for tools for risk stratification specific to brain health outcomes. Although guidelines strongly advocate for preoperative cognitive screening, adoption seems to be lagging behind, and the development of an array of tools will enable different institutions to implement screening measures tailored to their specific patient populations and resources (*Anesth Analg* 2018;127:1406-13; *Clin Anesth* 2020;62:109724).

The pursuit of preoperative cognitive screening, the integration of machine learning models, the nuanced understanding of benzodiazepine use, and the exploration of biomarkers all contribute to a deeper comprehension of perioperative brain health. As we become better at assessing perioperative neurocognitive risk, we will also be better equipped to assist patients in shared decision-making, proactive discharge planning, and targeted prevention. ■

Disclosure: Dr. Deiner is a board member of the American Board of Anesthesiology and an expert witness.