

ORIGINAL RESEARCH

Impact of Intraoperative Blood Pressure Target on the Incidence of Postoperative Cognitive Dysfunction (POCD) and Postoperative Delirium in Elderly Patients Under General Anesthesia: An Institutional Based Study

Jagadish Chendra Bose Yanam¹, Babu Rao Dharavath², Kishore Goud N³, Raju Kethavath⁴

¹Assistant Professor, Department of General Medicine, Nimra Institute of Medical Sciences, Vijayawada, Andhra Pradesh, India

²Associate Professor, Department of Anaesthesiology, Nimra Institute of Medical Sciences, Vijayawada, Andhra Pradesh, India

³Associate Professor, Department of Anaesthesiology, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal, India

⁴Assistant Professor, Department of General Medicine, Dr. B.R. Ambedkar Medical College & Hospital, Kadugondanahalli, Bengaluru, Karnataka, India

Corresponding Author

Dr. Raju Kethavath

Assistant Professor, Department of General Medicine, Dr. B.R. Ambedkar Medical College & Hospital, Kadugondanahalli, Bengaluru, Karnataka, India

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ABSTRACT

Aim: Postoperative cognitive dysfunction (POCD) describes a decline in cognitive ability from a patient's baseline that starts in the days after surgery and is prevalent in 1% of elderly patients after 1 yr. Hence; the study was conducted for evaluating the impact of maintaining an individualized intraoperative blood pressure target on the incidence of Postoperative Cognitive Dysfunction (POCD) and postoperative delirium in elderly patients under general anesthesia. **Materials and Methods:** A total of 50 patients of more than 70 years of age were enrolled. Complete demographic and clinical details of all the patients was recorded. Only those patients were enrolled which were scheduled under general anesthesia. Patients were randomized into two study groups: Group A: Patients with mean arterial pressure (MAP) \geq 90% of preoperative values, and Group B: Patients to a more liberal intraoperative blood pressure management. Neuropsychological assessment of all the patients was carried out preoperatively and postoperatively after three months. Incidence of POCD at three months and postoperative delirium were assessed. **Results:** POCD was seen in 20 percent of the patients of group A and in 12 percent of the patients of group B. Delirium was seen in 32 percent of the patients of group A and in 36 percent of the patients of group B. non-significant results were obtained while comparing the incidence of POCD and delirium among the patients of the two study groups. **Conclusion:** No Correlation Found Between Intraoperative Hypotension and Postoperative Cognitive Dysfunction or Delirium in Elderly Patients Undergoing General Anesthesia.

Keywords: Hypotension, Memory, Elderly.

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INTRODUCTION

Postoperative cognitive dysfunction describes a decline in cognitive ability from a patient's baseline that starts in the days after surgery and is prevalent in 1% of elderly patients after 1 yr.¹ Post-operative cognitive dysfunction is defined as a “more than

expected” post-operative deterioration in cognitive domains, including short-term and long-term memory, mood, consciousness, and circadian rhythm.² Postoperative cognitive dysfunction (POCD) after general anesthesia is now common all over the world.³ POCD refers to the patients, who have no

mental disorders before anesthesia, but the persistent disorders of memory, abstract thinking, and directional force would exist after anesthesia, along with the significant decline in social activities. Especially in aged patients, the proportion of POCD after surgery is high, as high as 10-62%, which seriously affects the social life ability and quality of life of aged patients.⁴ S100b protein is a member of the nerve tissue protein family, whose expression levels in glial cells and Schwann cells are significantly prominent.⁵ The phenomenon of increased serum S100b level can be observed in the patients with Alzheimer's disease, neuroglioma and hepatic encephalopathy.⁶ But its function and clinical significance in POCD need to be further discussed. Neuron-specific enolase (NSE): the serum NSE, which is a specific acid protease of neurons and neuroendocrine cells, is a specific sign of neuroendocrine tumor, including neuroblastoma, medullary thyroid carcinoma and small cell lung cancer (70% increases), which could be used for differential diagnosis, condition monitoring, curative effect evaluation and recurrence. But the role of NSE in POCD is still controversial.⁷⁻⁹ Postoperative cognitive dysfunction (POCD) and postoperative delirium are significant complications in elderly patients undergoing surgery. These conditions can lead to prolonged hospital stays, increased morbidity, and a decline in quality of life. Maintaining intraoperative blood pressure (BP) within a specific range has been hypothesized to mitigate these risks, but evidence is limited. This study aims to assess whether targeting an intraoperative BP of $\geq 90\%$ of baseline mean arterial pressure (MAP) reduces the incidence of POCD and postoperative delirium in elderly patients under general anaesthesia, compared to usual practice without a specified BP target.⁸⁻¹⁰ Hence; the study was conducted for evaluating the impact of maintaining an individualized intraoperative blood pressure target on the incidence of POCD and postoperative delirium in elderly patients under general anesthesia.

MATERIALS AND METHODS

The current research was conducted for evaluating the effect of maintaining an individualized intraoperative blood pressure target on the incidence of POCD and postoperative delirium. A total of 50 patients of more than 70 years of age were enrolled. Complete demographic and clinical details of all the patients was recorded. Only those patients were enrolled which were scheduled to under general anesthesia. Patients were randomized into two study groups:

Group A: Patients with mean arterial pressure (MAP) $\geq 90\%$ of preoperative values, and

Group B: Patients to a more liberal intraoperative blood pressure management.

Neuropsychological assessment of all the patients was carried out preoperatively and postoperatively after three months. Incidence of POCD at three months and

postoperative delirium were assessed. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

POCD was seen in 20 percent of the patients of group A and in 12 percent of the patients of group B. Delirium was seen in 32 percent of the patients of group A and in 36 percent of the patients of group B. non-significant results were obtained while comparing the incidence of POCD and delirium among the patients of the two study groups.

Table 1: Demographic data

Variable		Group A	Group B
Mean age (years)		73.5	74.1
Gender	Males	13	15
	Females	12	10
Residence	Rural	10	8
	Urban	15	17

Table 2: Incidence of POCD

POCD	Group A n (%)	Group B; n (%)
Present	5 (20%)	3 (12%)
Absent	20 (80%)	22 (88%)
Total	25 (100%)	25 (100%)

Table 3: Incidence of delirium

Delirium	Group A n (%)	Group B; n (%)
Present	8 (32%)	9 (36%)
Absent	17 (68%)	16 (64%)
Total	25 (100%)	25 (100%)

DISCUSSION

POCD is a multifactorial neurodegenerative disease influenced by various factors, including patient age, surgery type, anesthesia plan, postoperative pain, and educational level, all of which contribute to the risk of POCD.¹⁰ Postoperative cognitive dysfunction (POCD), as per the cognitive impairment classification in the DSM-V, is characterized as a mild neurological disorder resulting from routine surgical procedures, excluding conditions like deafness, dementia, or amnesia.¹¹ POCD entails a protracted cognitive decline lasting weeks, months, or even years and can be mistakenly conflated with postoperative delirium, presenting as an acute, fluctuating disturbance of consciousness typically within 1–3 days post.^{12, 13} Hence; the study was conducted for evaluating the impact of maintaining an individualized intraoperative blood pressure target on the incidence of POCD and postoperative delirium in elderly patients under general anesthesia.

POCD was seen in 20 percent of the patients of group A and in 12 percent of the patients of group B. Delirium was seen in 32 percent of the patients of group A and in 36 percent of the patients of group B. non-significant results were obtained while comparing

the incidence of POCD and delirium among the patients of the two study groups. Feng X et al searched PubMed, Embase, and Cochrane Library databases to find randomized controlled trials (RCTs) in which reported the relationship between intraoperative hypotension and POD or POCD. The retrieval time is up to January 2020, without language restrictions. They analyzed five eligible RCTs. Based on the relative mean arterial pressure (MAP), participants were divided into low-target and high-target groups. For the incidence of POD, there were two studies with 99 participants in the low-target group and 94 participants in the high-target pressure group. For the incidence of POCD, there were four studies involved 360 participants in the low-target group and 341 participants in the high-target group, with a study assessed both POD and POCD. No significant difference between the low-target and the high-target group was observed in the incidence of POD (RR = 3.30, 95% CI 0.80 to 13.54, P = 0.10), or POCD (RR = 1.26, 95% CI 0.76 to 2.08, P = 0.37). Furthermore, it also demonstrates that intraoperative hypotension prolonged the length of ICU stay, but did not increase the mortality, the length of hospital stay, and mechanical ventilation (MV) time. There is no significant correlation between intraoperative hypotension and the incidence of POD or POCD.¹⁴ Langer T et al assessed the effect of different intraoperative blood pressure targets on the development of POCD and test the feasibility of a larger trial. One hundred one patients aged ≥ 75 years with ASA physical status < 4 , undergoing elective, non-cardiac surgery under general anesthesia and 33 age-matched healthy controls. Randomization to a personalized intraoperative blood pressure target, mean arterial pressure (MAP) $\geq 90\%$ of preoperative values (Target group), or to a more liberal intraoperative blood pressure management (No-Target group). Strategies to reach intraoperative blood pressure target were at discretion of anesthesiologists. The Target group spent a higher percentage of intraoperative time with MAP $\geq 90\%$ of preoperative values ($65 \pm 25\%$ vs. $49 \pm 28\%$, $p < 0.01$). Incidence of POCD (11% vs. 7%, relative risk 1.52; 95% CI, 0.41 to 6.3; $p = 0.56$) and delirium (6% vs. 14%, relative risk, 0.44; 95% CI, 0.12 to 1.60; $p = 0.21$) did not differ between groups. No correlation was found between intraoperative hypotension and postoperative cognitive performance ($p = 0.75$) or delirium ($p = 0.19$). Recruitment rate was of 6 patients/month (95% confidential interval (CI), 5 to 7) and drop-out rate at 3 months was 24% (95% CI, 14 to 33%).¹⁵

CONCLUSION

No Correlation Found Between Intraoperative Hypotension and Postoperative Cognitive Dysfunction or Delirium in Elderly Patients Undergoing General Anesthesia.

REFERENCES

1. International Surgical Outcomes Study Group Global patient outcomes after elective surgery: prospective cohort study in 27 low-, middle- and high-income countries. *Br J Anaesth.* 2016;117:601–9.
2. Caza N, Taha R, Qi Y, Blaise G. The effects of surgery and anesthesia on memory and cognition. *Prog Brain Res.* 2008;169:409–22.
3. Spalletta G, Girardi P, Caltagirone C, Orfei MD. Anosognosia and neuropsychiatric symptoms and disorders in mild Alzheimer disease and mild cognitive impairment. *J Alzheimers Dis* 2012; 29: 761-72.
4. Vatter H, Konczalla J, Seifert V. Endothelin related pathophysiology in cerebral vasospasm: what happens to the cerebral vessels? *Acta NeurochirSuppl* 2011; 110: 177-80.
5. Peng L, Xu L, Ouyang W. Role of peripheral inflammatory markers in postoperative cognitive dysfunction (POCD): a meta-analysis. *PLoS One* 2013; 8(Pt 1): e79624.
6. Scott DA, Evered LA, Silbert BS. Cardiac surgery, the brain, and inflammation. *J Extra Corpor Technol* 2014; 46: 15-22.
7. Zhang CX, Zhang DJ, Wang YL, Han W, Shi GC, Zhang HQ. Expression level of NSE, S100B and NPY in children with acute miliary phthisis and secondary tubercular meningitis. *Eur Rev Med Pharmacol Sci* 2016; 20: 1474-78.
8. Li JZ, Li XZ, Wang XM, Wang MS, Yu HF, Shi F, Miao D, Bi YL. Effects of parecoxib sodium analgesia on serum concentrations of neuron-specific enolase and S-100 β and postoperative cognitive function of elderly patients undergoing acute replacement of femoral head. *Zhonghua Yi Xue Za Zhi* 2013; 93: 2152-54.
9. Peng L, Xu L, Ouyang W. Role of peripheral inflammatory markers in postoperative cognitive dysfunction (POCD): a meta-analysis. *PLoS One* 2013; 8: e79624.
10. Belrose J. C., Noppens R. R. Anesthesiology and cognitive impairment: a narrative review of current clinical literature. *BMC Anesthesiol.* 2019; 19:241. doi: 10.1186/s12871-019-0903-7, PMID:
11. Am Psy Assoc. 5thEd. 2013. Diagnostic and statistical manual of mental disorders. 21, 591–643.
12. Steinmetz J., Christensen K. B., Lund T., Lohse N., Rasmussen L. S. Long-term consequences of postoperative cognitive dysfunction. *Anesthesiology* 2009; 110, 548–55. doi: 10.1097/ALN.0b013e318195b569
13. Whitlock E. L., Vannucci A., Avidan M. S. Postoperative delirium. *Minerva Anesthesiol.* 2011;77, 448–56.
14. Feng X, Hu J, Hua F, Zhang J, Zhang L, Xu G. The correlation of intraoperative hypotension and postoperative cognitive impairment: a meta-analysis of randomized controlled trials. *BMC Anesthesiol.* 2020;20(1):193. doi:10.1186/s12871-020-01097-5
15. Langer T, Santini A, Zadek F, Chiodi M, Pugni P, Cordolcini V et al. Intraoperative hypotension is not associated with postoperative cognitive dysfunction in elderly patients undergoing general anesthesia for surgery: results of a randomized controlled pilot trial. *J Clin Anesth.* 2019 Feb;52:111-18. Epub 2018 Sep 20. PMID: 30243062.