Open Access Indonesian Journal of Medical Reviews

Journal Homepage: https://hmpublisher.com/index.php/OAIJMR

Post Operative Cognitive Dysfunction: A Literature Review

Irfan Ferdinand Tambunan[1*]

[1]Department of Anesthesiology and Intensive Care, Faculty of Medicine, Universitas Sriwijaya, Palembang, Indonesia

ARTICLE INFO

Keywords:
Anesthesia
Postoperative cognitive dysfunction
Surgery

***Corresponding author:**
Irfan Ferdinand Tambunan

E-mail address:
ferdinand.8870@gmail.com

The author has reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/oaijmr.v1i1.29

A B S T R A C T

Along with ages, elderly patients with comorbid who undergoing surgical procedures are more likely to experience cognitive disorders such as decreased quality of life and loss of independence. This is known as postoperative cognitive dysfunction. The percentage is quite significant for old age to experience cognitive disorders. Ages, education level, health and mental status can be a factor causing cognitive disorders. Comprehensive assessment of objective mental, social and functional status can increase patient preoperative. Perioperative pharmacological management can reduce the incidence of POCD. For example, minimal use of propofol in spinal anesthesia may reduce POCD in hip fracture surgery. The use of dexmedetomidine in ventilated patients in the ICU may also reduce POCD. The etiology is still unclear, but there is a suspicion that the use of neurotoxic anesthetics can trigger the occurrence of POCD, but this has not been further proven.

1. Introduction

Anesthesia is thought to be the leading cause of cognitive changes. Bedford[1] in 1955 found that PCOD was 10% more common in elderly patients. He also explained that severe cases of POCD could persist until death.[2] The Diagnostic and Statistical Manual of Medical Disorders (DSM) defines delirium as a change in aspects of consciousness followed by cognitive changes. Failed to maintain and divert attention and thoughts, inability to focus on one thing are symptoms that can occur.[3] It is estimated that 20% of 12.5 million elderly individuals experience postoperative delirium. Symptoms of delirium can be hyperactive, hypoactive, or a mixture of both. Hyperactive patients such as talking fast, irritability, restless. In comparison, hypoactive patients tend to be calmer with symptoms such as inability to answer simple questions, lack of mobility in daily activities, and inattention.[4,5]

Postoperative cognitive dysfunction

Post Operative Cognitive Dysfunction is defined as a new cognitive disorder that arises after surgical procedures. Post Operative Cognitive Dysfunction diagnosis requires preoperative and post-operative psychometric tests. Post Operative Cognitive Dysfunction is a disorder of concentration, and difficulty processing the information obtained and memory. Post Operative Cognitive Dysfunction itself is

not a psychiatric diagnosis but is better known as a neurocognitive disorder. The diagnosis must be supported by neuropsychological testing where the onset of events is recent and lasts for at least two weeks. Symptoms of POCD vary from mild memory loss to an inability to concentrate. A study analyzed the severity of POCD. Against 77 patients who underwent non-cardiac surgical procedures and were evaluated 3 months later. Cognitive impairment was found along with memory impairment causing functional limitations of the patient. Meanwhile, patients with only memory impairment do not experience functional limitations.[6,7]

Research on post operative cognitive dysfunction

In 1998 a multinational research group conducted a prospective study describing postoperative cognitive decline. Patients aged 60 years or over who will undergo orthopedic or abdominal major surgery procedures have undergone a series of psychometric tests. As a result, 25% of patients experienced cognitive impairment after discharge from the hospital, and 10% experienced cognitive impairment three months after surgery. Monk et al also conducted a similar study, evaluating patients of all ages undergoing non-cardiac surgery procedures, and found POCD to occur in 30%-40% of patients of all ages at the time of hospital discharge.

There are many investigations of Bedford's theory which states that anesthesia is responsible for the occurrence of cognitive impairment. There are two large prospective studies evaluating cognitive function under regional and general anesthesia. As a result, both studies showed no association between anesthesia and long-term cognitive impairment. However, if the patient receives opioids at the time of surgery, it will increase the possibility of postoperative cognitive impairment. As previously explained, the mechanism of this cognitive impairment is not clear. Many things can be a factor in the occurrence of this cognitive impairment, such as the level of cognition of the patient before surgery, the patient's health status, perioperative events related to the operation, and the neurotoxic effects of anesthetic drugs.[8, 9,10]

Inhalation anesthesia

During this time, inhalation anesthetics are considered to have very little effect, but now concerns about the neurotoxic effects of inhalation anesthetics are starting to emerge. A study conducted by Eckenhoff in 2014 showed that the use of inhalation anesthetics, especially halothane and isoflurane gas, caused pathological changes in the brain which later led to Alzheimer's disease which is more common in elderly patients. In addition, isoflurane can also cause neurofibrillary formation, which is a significant feature of Alzheimer's disease. This is a concern that inhalation anesthetics will accelerate the process of Alzheimer's and contribute to postoperative cognitive impairment.[9,10,11]

Does the preoperative cognitive function influence the postoperative cognitive function?

A number of studies also say that cerebral infarction can cause cognitive impairment. Satz's study about the concept of brain reserve may explain that patients with greater brain reserve may be a protective factor for Post Operative Cognitive Dysfunction. In contrast, patients with smaller brain reserves are more prone to developing Post Operative Cognitive Dysfunction. In figure 1, it is explained that group A patients with larger brain reserves compared to group B with less brain reserves. As a result, patients in group A after undergoing surgery did not experience cognitive impairment. Meanwhile, group B patients after undergoing surgical procedures showed significant cognitive changes leading to post-operative cognitive dysfunction.[12,13,14,15]

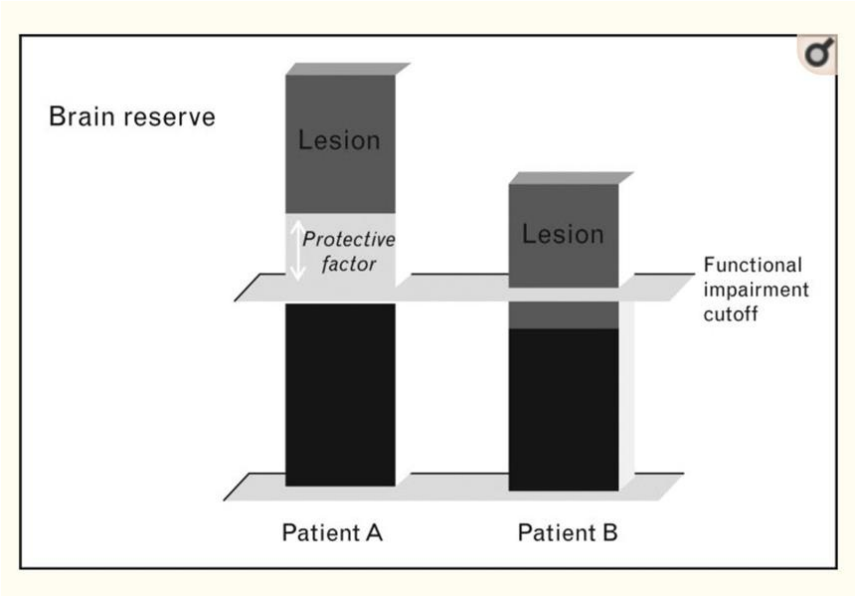

Figure 1. Brain reserve capacity and threshold concept.

2. Conclusion

The cause of POCD has not yet been explained. The suspicion of heterogeneous disorders and other preoperative and postoperative factors predisposes to POCD. Other evidence suggests that patients with brain disorders are the most severe risk factors for POCD. In the future, further research should be carried out immediately in order to prevent and treat postoperative cognitive problems.

3. References

1. Bedford PD. Adverse cerebral effects of anaesthesia on old people. Lancet. 1955; 269:259–63.
2. Monk TG, Weldon BC, Garvan CW, et al. Predictors of cognitive dysfunction after major noncardiac surgery. Anesthesiology. 2008; 108:18–30.
3. American Psychiatric Association. Diagnostic criteria from DSM-IV-TR. Washington, D.C.: American Psychiatric Association; 2000.
4. Steinmetz J, Christensen KB, Lund T, et al. Long-term consequences of postoperative cognitive dysfunction. Anesthesiology. 2009; 110:548–55.
5. Funder KS, Steinmetz J, Rasmussen LS. Methodological issues of postoperative cognitive dysfunction research. Semin Cardiothorac Vasc Anesth. 2010; 14:119–22.
6. Price CC, Garvan CW, Monk TG. Type and severity of cognitive decline in older adults after noncardiac surgery. Anesthesiology. 2008; 108:8–17.
7. Steinmetz J, Christensen KB, Lund T, et al. Long-term consequences of postoperative cognitive dysfunction. Anesthesiology. 2009; 110:548–555.
8. Moller JT, Cluitmans P, Rasmussen LS, et al. Long-term postoperative cognitive dysfunction in the elderly ISPOCD1 study. ISPOCD investigators International Study of Post-Operative Cognitive Dysfunction. Lancet. 1998; 351:857–861.
9. Rasmussen LS, Johnson T, Kuipers HM, et al. Does anaesthesia cause postoperative cognitive dysfunction? A randomised study of regional versus general anaesthesia in 438 elderly patients. Acta Anaesthesiol Scand. 2003; 47:260–266.
10. Williams-Russo P, Sharrock NE, Mattis S, et al. Cognitive effects after epidural vs general anesthesia in older adults. A randomized trial.

JAMA. 1995; 274:44–50

11. Eckenhoff RG, Johansson JS, Wei H, et al. Inhaled anesthetic enhancement of amyloid-beta oligomerization and cytotoxicity. Anesthesiology. 2004; 101:703–09
12. Greene NH, Attix DK, Weldon BC, et al. Measures of executive function and depression identify patients at risk for postoperative delirium. Anesthesiology. 2009; 110:788–795. [PubMed: 19326494]
13. Smith PJ, Attix DK, Weldon BC, et al. Executive function and depression as independent risk factors for postoperative delirium. Anesthesiology. 2009; 110:781–7.
14. Satz P. Brain reserve capacity on symptom onset after brain injury: a formulation and review of evidence for Threshold Theory. Neuropsychology. 1993; 7:273–75.
15. Lund C, Sundet K, Tennoe B, et al. Cerebral ischemic injury and cognitive impairment after off- pump and on-pump coronary artery bypass grafting surgery. Ann Thorac Surg. 2005; 80:2126–31. Epub ahead of print.