Editorial
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Cognitive Dysfunction After General Anaesthesia in Adults

Vinay Marulasiddappa* and Gowry Rajendran

Bangalore Medical College, Bengaluru – 560002, Karnataka, India; drvinaym@gmail.com

1. Introduction

General anaesthesia which was discovered over 150 years ago has enabled the modern surgical practice possible by rendering the patient pain-free and unconscious. General anaesthesia can be defined as a reversible loss of consciousness induced by drugs which affect brain function at multiple levels including neuronal membranes, receptors, ion channels, neurotransmitters, cerebral blood flow and metabolism. The functional equivalents of these impairments involve mood, memory, motor function and behavioural changes.

With advancements in health care, the average life expectancy is increasing and hence a large proportion of elderly patients are undergoing major surgeries. Central Nervous System (CNS) dysfunction following surgery can occur in any age group, but it is more commonly seen in the elderly age group.

When these changes are persistent, cognitive decline after surgery can lead to an increased risk of disability and mortality, which can result in loss of independence and reduction in quality of life. Post Operative Cognition Dysfunction (POCD) is defined by a range of changes in a patient's cognition and behaviour weeks or even months after anaesthesia. According to The International Society of Postoperative Cognitive Dysfunction when a patient develops post-operative deficits in one or more discrete areas of mental state, such as attention, concentration, executive function, memory, visuospatial ability and psychomotor speed, it can be considered as post-operative cognitive dysfunction. In a large multi-centre trial including 1200 patients, the international study of POCD showed a 10% incidence of POCD in the elderly 3 months after surgery.

2. Aetiology and Pathogenesis

The aetiology and pathogenesis of POCD is not clearly understood. Drugs or environments causing an imbalance in the homeostasis of cerebral physiology can later manifest as a decline in mental functions. Major and more invasive procedures such as thoracic, abdominal and vascular surgery are associated with higher risk. POCD is more commonly seen in the elderly as the physiological regulatory processes are affected with advanced age. The incidence of multiple comorbidities with altered pharmacokinetics and pharmacodynamics, impaired hepatic and renal clearance and altered drug sensitivity make the elderly more vulnerable.

Hypocapnia due to hyperventilation resulting in cerebral vasoconstriction has been correlated with prolonged cognitive dysfunction following the episode. Cerebral micro embolism due to clots or air bubbles during cardiopulmonary bypass in cardiac surgery has been proposed as a cause of minor neurologic deficits postoperatively. However acute and chronic POCD has been found often in non-cardiac surgery as well.

During the perioperative period, tissue injury occurs which is followed by an inflammatory response which can cause neuronal inflammation and cerebral tissue damage which can lead to a delay of recovery and postoperative dysfunction of CNS.

There was no correlation observed between CNS dysfunction and type of anaesthesia, however, patients with a history of alcohol abuse, using medications with anticholinergic properties, history of previous cerebral vascular accident, previous POCD, poor cognition, respiratory complications, infectious complications and second operation were at greater risk.

**Author for correspondence*

3. Consequences of POCD

Long-term consequences of POCD include increased mortality, early retirement from the occupation as well an increased burden on the health care system. POCD has to be differentiated from other CNS dysfunctions, mainly from delirium which has an immediate onset within 1-3 days after surgery whereas POCD has subtle but variable onset from 2 weeks to 2 months after surgery. Delirium is characterised by fluctuating levels of consciousness associated with inattention and change in consciousness and is diagnosed by DSM-5 criteria (Diagnostic and Statistical Manual of Mental Disorders - 5th edition).

4. Diagnosis

POCD is diagnosed by comparing psychometric testing done pre and post-operatively. These include the trail-making test where the subject is asked to connect numbers in ascending order to test dexterity, the digit span test testing the number of digits the subject can remember to assess short-term memory, the Stroop test in which the subject must read out names of colours and the colour in which they are printed. This tests attention and concentration.

Erzigkeit's short cognitive test is an alternative which can be performed faster. Mini-Mental State Examination (MMSE) is used as a screening test for dementia and is sometimes used to quantify cognitive dysfunction. MMSE can be used to identify dementia preoperatively which is a risk factor for developing cognitive dysfunction postoperatively. The cognitive failure questionnaire is a self-administered questionnaire with 25 different items to identify cognitive errors in everyday life.

5. Perioperative Strategies

Perioperative strategies can be adopted to prevent cognitive decline which includes period practice cognitive training for high-risk and very old patients, employing surgical techniques to prevent complications and minimally invasive techniques and careful anaesthetic management such as cautious use of sedatives, using short-acting anaesthetics and techniques to prevent perioperative disturbances of homeostasis and organ ischemia and tight intraoperative management of fluid, electrolyte and glycaemic balance. Other strategies include repeated orientation to their surroundings, ensuring uninterrupted night-time sleep, early mobilisation in the postoperative period, allowing easy access to glasses and hearing aids, avoiding dehydration and removing urinary catheters, nasogastric tubes and intravenous catheters.

6. Management

Endocrine, kidney, liver or neurological diseases need to be investigated. Supportive therapy plays a major role in the treatment. Sufficient ventilation, oxygenation and hemodynamic support have to be provided for recovery. Adequate post-operative pain control is essential with pharmacological and non-pharmacologic methods. The regular measurement of vital signs and frequent communication with the patient to identify any aberrant behaviour should be started immediately. The assessment of the ability to swallow is required before starting feeding per oral. Clock mounted in a prominent position, a calendar and watching the news can help reorientation. Providing a room with adequate natural light helps the patient achieve a normal circadian rhythm. Patients with aggressive behaviour are treated with antipsychotic agents like haloperidol or risperidone.

7. Future

During recent years POCD has been a growing concern for the surgical and the supporting teams. Surgeries in the ageing population are increasing, hence the incidence of POCD. Strategies for the management of these patients should be a multimodal approach involving close cooperation between the anaesthesiologist, surgeon, geriatricians and family members to promote early rehabilitation and avoid loss of independence in these patients. Future clinical and basic research focusing on the mechanisms and pathways involved is critical for better understanding and management of this cognitive dysfunction after surgery.

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