REVIEW ARTICLE *UDK: 616-089.168-06:616.8*

PERIOPERASTIVE NEUROLOGICAL COMPLICATIONS AND COGNITIVE DYSFUNCTION

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Abstract

Perioperative neurological complications and cognitive dysfunctions are common in elderly patients. Neurological complications are often seen in the perioperative period and these complications are damaging to patients' well-being. Neurophysiological dysfunction in the perioperative period is the result of hypotension, hypoperfusion and brain hypoxia. Cytokine inflammatory response to operative trauma can damage neurological function at subcellular level.

Neurological complications can be acute, or de novo events such as stroke, nerve injury and delirium. Also, neurological complications can occur as decompensation of chronic neurological disease. In acute and chronic neurological impairment, patients can suffer from health problems that are affecting their social and medicolegal wellbeing. Most common neurological complications are delirium, stroke, postoperative cognitive disorder, neuroleptic malignant-like syndrome. Delirium is a devastating life-threatening disorder that has a great impact on the brain cell metabolism. Stroke is a rare complication, however it is 20 times more frequent among patients who had a stroke before surgery. In the perioperative period we can witness aggravation of a significant number of diseases, including Parkinson's disease, myasthenia gravis, epilepsy. We also have to mention the perioperative peripheral neuro injuries. Local anesthetics that are used as painkillers, such as lidocaine, can cause central nervous system toxicity. The interaction of the medications, such as beta blocker antiarrhythmics, should be considered a factor for enhancing the neurotoxicity of the local anesthetics. Cognitive postoperative disorder includes a wide spectrum of symptoms during the perioperative period. They can manifest preoperatively as acute preoperative delirium, postoperative delirium – an event that can manifest hours to days after surgery, delayed cognitive dysfunction- an event that can occur within 30 days after surgery and postoperative neurocognitive dysfunction, which can occur between 30 days to 1 year after surgery.

Key words: *delirium; neurocognitive; perioperative.*

Introduction

Neurological complications and cognitive dysfunction are common in the perioperative period. They are the result of hypoperfusion of the brain, hypotension and hypoxia. These factors can cause changes in the brain tissue perfusion. The usage of neuroactive substances during the operative period can impair the neurological functions on subcellular level. Neuroinflammation is a key factor for developing neurological disorders. Operative trauma and the assosicated inflammatory response of the brain can initiate neuroinflammation, which is characterized

by the presences of microglial astrocytes cells and inflammatory cells. Biochemically, the two biomarkers that are connected to the brain damage are β-amyloid protein and intraneuronal neurofibrillary tangles (tau). Changes in their levels is a prediction for developing cognitive disorders. Neurocognitive disorders can last for a short period of time -days or long period of time - months or even years. They affect the quality of everyday living, affect the patient's sense of self-care and impact the socioeconomic stability, which sometimes can result in lethal outcome. As populations age, and the proportion of individuals undergoing surgery after 60 increases, neurocognitive disorders are becoming an important part of every society. The incidence of perioperative neurological complications is about 44 % in noncardiac operations. The percentage is higher in cardiac operations, especially in bypass operations. The term "Neurocognitive Disorders" (NCD) is used to describe the overall situation identified during the pre- and postoperative periods. Neurological complications can be classified as acute, de nuovo, or they can be a result of the decompensation of chronic neurological disease. Complications such as delirium, can occur 7 days after surgery, while the cognitive decline can last 30 days after and cause delayed neurocognitive recovery. Neurocognitive decline that exists 12 months after surgery is postoperative neurocognitive disorder.

Delirium is most common neurocognitive disorder with incidents of 25% in the perioperative period. Initially, it is manifested with confusion, loss of memory, problems with maintaining attention, and problems with understanding common sentences. Delirium can be presented in a hypoactive or a hyperactive form, or combined. Delirium has fluctuations during the day.

Risk factors related to neurocognitive disorders include age, previous NCDs, functional impairments, hearing impairments, comorbidity, high ASA score in perioperative disorders such as inadequately treated pain, fluid and food fasting, medications opioids, anticholinergic drugs, intraoperative depth of anesthesia management, blood loss, cerebral desaturation, hypotension, hypothermia. They also include the type and the duration of surgery, postoperative factors such as pain infections, prolonged ICU stay and ventilation, extended periods of opioid use, and anticholinergic drugs. Anticholinergic drugs can be categorized as anticholinergic drug with weak effect - score 1:Atenolol Codeine, Diazepam, Digoxin, Furosemide, Morphine, Prednisolone; drugs with medium effect - score 2 : Amantadine , Carbamazepine, Loperamide, Nefopam, Theophylline, Tramadol Amitriptyline, and drugs with strong effect - score 3 :Atropine, Chlorphenamine, Oxybutynin, Quetiapine, Solifenacin , Tolterodine. If the sum of the drug scores patients receive is higher than 3, it is likely that they can develop confusion in the perioperative period. The recommendation is patients to stop consumming alcohol two weeks prior the operation, detoxification. The use of the second generation of antipsychotic drugs such as dexmedetomidine, melatonin and gabapentin have a positive effect for treatment of delirium. Delirium prevention consists of preoperatively routine in therapy, exercise, cognitive stimulations, solid sleep routine, hydration and adequate nutrition. Intraoperative prevention consists of anesthetic technics for delirium prevention, such as the usage of the bi spectral index-BIS, entropy, NIRS, cerebral oxygen saturation monitoring, regional anesthesia, and reduced use of opioids. Ketamine and dexmedetomidine are recommended drugs for delirium prevention. In the postoperative period, delirium prevention consists of enhanced sleep and therapy routines, early mobility vision and hearing optimization, exercise, analgesia prevention of infections, and short stay at the ICU. For delirium monitoring, it is recommended to use the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) or Intensive Care Delirium Screening Checklist (ICDSC).

Postoperative cognitive dysfunction is cognitive dysfunction that last for more than 30 days. It is common among elderly patients but it can also occur in patients who have not underwent surgery. The main question is: is it a different clinical entity as it is very similar to delirium.

Neurological disorders

Stroke is not a very common neurological disorder, but it can have catastrophic consequences when it occurs. Therapy consists of thrombolysis, but it is a compromising technique in the postoperative period. One of the main risk factors is suffering from a recent stroke as the risk is 20 times higher to cause a perioperative stroke. It is recommended to stop oral anticoagulation therapy 48 to 72 hours before surgery, ad to stop administering clopidrogel 7 days before surgery. There is no need to stop the use of aspirin before surgery. If the stroke occurs postoperatively, then it is recommended to apply mechanical thrombectomy.

Patients with Parkinson's disease are in a higher risk of developing postoperative neurocognitive disorder. It is recommended that these patients take their therapy regularly. With signs of decompensation, such as difficulty in swallowing or rigid musculature, the symptoms can increase and the risk of aspirations during the intubation can also increase, while during the postoperative period, the muscle rigidity can affect the respiratory function. Patients with Parkinson's disease should be in optimal condition before the elective surgery. In nonelective surgery we should be aware of the risks of developing neuroleptic malignant syndrome during operation, hyperthermia with signs of muscle rigidity, difficulty in swallowing, malfunctioning of the autonomic nervous system , which can create increase in kinase that indicative of the possibility for a cardiac arrest, stroke, etc. These patients often exhibit signs of altered state of consciousness. Patient should receive therapy through a nasogastric tube or transdermal levodopa. A high possibility for the occurrence of neurocognitive disorder during the perioperative period is found among patients with myasthenia gravis. These patients should be in optimal condition and a perioperative examination is necessary if there are signs of bulbar syndrome, such as difficulty in swallowing, impairment of the speech, weakness of facial muscle. There is also a high risk of aspiration dyspnea and pneumonia. During the perioperative period, myasthenia gravis crises can occur, as well as bulbar syndrome. The level of acetylcholine receptors antibodies is higher than 100nmol/l. Medications that can worsen the situation are muscle relaxants, therefore, they should be applied with great conscience. We should be careful with aminoglycosides, macrolides, fluoroquinolones, glucocorticoids,β-adrenoceptor blocker and calcium channel blockers.

Conclusion

Neurocognitive disorders are common in elderly patients who have underwent surgery. Early diagnosis, preventing risk factors, implementing the strategies that can prevent, cure and optimize the patients' condition as soon as possible are imperative.

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