Postoperative Cognitive Dysfunction
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A R T I C L E  I N F O

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A B S T R A C T

The impact of general anesthesia on cognitive impairment is controversial and complex. A large body of evidence supports the association between exposure to surgery under general anesthesia and the development of delayed neurocognitive recovery in a subset of patients. Existing literature continues to debate whether these short-term effects on cognition can be attributed to anesthetic agents themselves or whether other variables are causative of the observed changes in understanding. Furthermore, there are conflicting data on the relationship between anesthesia exposure and the development of long-term neurocognitive disorders or incident dementia in the patient population with normal preoperative cognitive function. Patients with pre-existing cognitive impairment present a unique set of anesthetic considerations, including potential medication interactions, challenges with cooperation during assessment and non-general anesthesia techniques, and the possibility that pre-existing cognitive impairment may impart a susceptibility to further cognitive dysfunction.

Introduction

Postoperative cognitive dysfunction (POCD) can be found after surgery, and it can affect patients’ daily activity life, particularly in older patients. POCD has received attention around the globe. The increased POCD research on patients, medicine, and rehabilitation can also set the treatment safer and the diagnosis more accurate. POCD research is in high motion, but the pathogenesis is not found due to inconclusive results and contradicting evidence. But the basic POCD is related to neuropsychiatric diseases, such as dementia, depression, and Alzheimer’s disease. They are related to the research of POCD, the morbidity in older patients (>60 years old) approximately 25.8% in 7 days post-surgery and 10% in 3 months after surgery. The risk of POCD at three months and one-year post-surgery is 29% and 33.6%.

The definition of POCD is not universally agreed upon, and the examination methods are challenging to match. Strategies for the treatment of POCD revolve around the inhibition of microglia activation and improvement of cerebral microcirculation, but so far, the treatment results have not been maximized.

Postoperative POCD disorders and their association with general anesthesia were first introduced in 1955. POCD is often defined as a cognitive impairment that can be measured by neuropsychological examination of the patient, which may affect memory and motor function. In 2018, recommendations for nomenclature were used to clarify the definition of POCD further.

Postoperative cognitive dysfunction

Basic neuroscientific research on cognitive and behavioral disorders as the basis of anesthesia will
improve our understanding of the effects of anesthetic agents on brain mechanisms during conscious and unconscious states. Older patients often experience cognitive decline after surgery and anesthesia. There are two common cognitive disorders which are POCD and delirium. These disorders involve disturbances in cerebral oxidative metabolism and abnormalities in multiple neurotransmitters and ion gate voltages.

Table 1. Nomenclature used for cognitive impairment at different peri-operative time periods

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Nomenclature</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>Mild Neurocognitive Disorder</td>
<td>DSM-5 definition: (1) cognitive concern from individual/informant/diagnosis +</td>
</tr>
<tr>
<td></td>
<td>(NCD)</td>
<td>(2) objective evidence of decline of ≥ 1 SD compared to normative group + (3)</td>
</tr>
<tr>
<td></td>
<td>Major NCD</td>
<td>maintained ADLs &amp;/or AELs</td>
</tr>
<tr>
<td>Emergence</td>
<td>Emergency exciton or delirium</td>
<td></td>
</tr>
<tr>
<td>After operation to postoperative day 10</td>
<td>Postoperative delirium</td>
<td>Fluctuating changes in attention, mental status, or level of consciousness which occur in hospital up to 1 week following surgery</td>
</tr>
<tr>
<td>From expected recovery to postoperative day 10</td>
<td>Delayed neurocognitive recovery</td>
<td>Cognitive decline meeting DSM-5 criteria for mild or major NCD, diagnosed within the 30 day recovery period</td>
</tr>
<tr>
<td>Greater than 12 months postoperatively</td>
<td>Routine DSM-5 nomenclature</td>
<td>Postoperative specifier is NO LONGER attached if neurocognitive disorder is first diagnosed after this time.</td>
</tr>
</tbody>
</table>

Uncontrollable responses of glial cells, neurotoxin changes, and neurotrophic relief are conditions associated with POCD. There is evidence of biological changes in the brain, particularly postop inflammation. Intracellular complexes and their differences are related to causal pathways. Until now, many resources are needed for CNS research to determine cognitive dysfunction disease.2

Postoperative delirium

POD can be defined as an acute confusional state accompanied by disturbances of consciousness, perception, memory, and orientation. Decreased attention is the most common symptom of POD, making it possible to distinguish it from other neurocognitive disorders.

POD can develop into an active or passive form; a passive form is a form that is often encountered but is often overlooked and is often associated with a poor prognosis. Patients with passive delirium are often misdiagnosed as depression or dementia. With risk factors ranging from 30% to 50%, POD is the most common postoperative complication in elderly patients.

Therefore, periodic examinations of POD are usually performed in elderly patients three times a day, carried out in conjunction with post-anesthesia care and continuing until the 5th postoperative day.

Anesthesia in cognitive impairment

The researcher has found that children age four years old was associated with a mean difference of 0.41% (95% CI 0.12 – 0.70%) lower school grades and 0.97% (95% CI 0.15 – 1.78%) lower IQ test scores, and on an older patient, the impact of cognitive impairment was higher.10 Researchers still can’t show that glutamatergic drugs can cause developmental impairment in children, but excitotoxicity has already been proposed.11

Doing anamnesis before anesthesia and surgery can help assess cognitive changes after surgery and will help to diagnose perioperative mental disorders with NCD.6 Lowering the risk of POCD is an essential
task for anaesthesiology. There is other research aiming at improving patients outcomes.\textsuperscript{7}

**Conclusion**

POCD can be seen in most postoperative patients in the old patient. With the high number of geriatric patients doing surgery, the effect of anesthesia and surgery on the risk of dementia is high. To this day, researchers can still pinpoint why anesthesia and surgery impact brain changes resulting in cognitive deterioration.

Research showed an increased risk of reversible cognitive dysfunction in an old patient. And other research is needed to differentiate the differential diagnosis. Old patient’s mental need to be monitored before and after surgery because the old patient can be quickly experiencing cognitive dysfunction after surgery.

**References**

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