# Post Operative Cognitive Dysfunction: Alzheimer's disease and Anesthesia


## CONTACT

Cristina Bayardelle
Nova Southeastern University


## INTRODUCTION

According to existing literature, the cognitive function of the elderly has been reported to decline subsequently after anesthesia, however, whether or not these anaesthetics directly trigger lasting cognitive dysfunction remains debatable (Monk & Price, 2011). It remains a cause of concern because unlike younger individuals who may be able to tolerate neurotoxicity of anesthetic agents, the aging persons lose cerebral reserve, their blood-brain barrier is more permeable and drugs are eliminated at a slower rate which could possibly have deleterious outcomes and perhaps also precipitate neurodegenerative disorders. Several neuro-pathophysiological investigations have proposed that post-operative cognitive disorder (POCD) and Alzheimer's disease (AD) appear to share a similar mechanism, involving aberrant function of the cholinergic system in the brain, through amyloid beta peptide oligomerization and hyper-phosphorylation of Tau proteins (Baranov et al., 2009; Fodale, Santamaria, Schifilliti & Mandal, 2010; Xie & Tanzi, 2006). Kotekar, Kuruvilla and Murthy (2014) report that numerous previous investigations involved patients undergoing cardiac surgery who presented extensive cognitive dysfunction, majority of that, though, was inferable from prior cardiac inadequacy, perioperative hemodynamic instability and elevated frequency of depression after operation.

## METHODS AND MATERIALS

Cognitive function was assessed by exercising a set of neuropsychological tests as explained below. The baseline session performed two days prior to the surgical procedure was termed "pre-operative" and sessions at days 3, 7, and 30 following the operation was post-operative. "Stroop color word tests" assesses the mental speed, selective attention as well as susceptibility to interference. It comprises of two cards each showing 40 stimuli; the colors' names are printed in colored incongruous ink. The first part is the time taken to read the color of printing ink followed by noting the time taken to recognize the name of the color. Together, these two form the dependent variables and the errors in both parts are recorded (Dijkstra et al., 1999). This test is frequently employed to evaluate the AD related cognitive impairment in elderly patients. Moreover, it can also sensitively distinguish between elderly patients with mild AD and those with pre-clinical stage of AD suffering from mild cognitive dysfunction, from individuals with normal cognitive function. (Yun et al., 2011). Visual verbal learning test is the visual adaptation of testing secondary memory (Kotekar et al., 2014). Two sequential trials are carried out whereby the patient needs to remember and procreate a lineup of fifteen words. The number of words recalled during the trials forms the dependent variable. It involves immediate recall after five minutes (part one) and an assessment of delayed recall after 20 minutes (part two). This activity allows the measurement of learning ability and subsequent analysis of memory retrieval (Dijkstra et al., 1999). Statistical analysis was performed using SPSS.

## RESULTS

Overall, it is expected that POCD in majority patients will gradually decline over time (at day 3, day 7, and then at day 30 respectively), firmly linked to sex as a prime factor. Interestingly, more females than males may appear to be prone to POCD. Patients with higher education may be less influenced by POCD. Age is expected to emerge as a critical factor playing a role in the incidence of POCD. The "Stroop color word test" will highlight evidence of significant effects on parts of cognitive domain including selective attention, mental speed and susceptibility to interference. It is likely that the patients will require additional time to finish the task in comparison with the pre-operative levels. The ability to learn and the capacity to retrieve information were measured in two parts using the visual verbal learning tests. In both set-ups, the performance of patients may be considerably lowered after 3, 7 and 30 days of surgery in comparison with the performance on the pre-operative day.

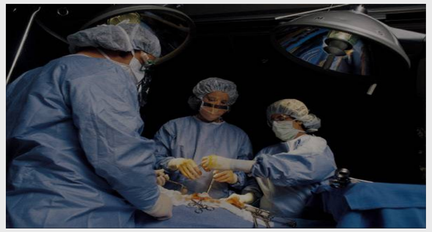

**Figure 2.** Label in 18pt Arial.

## DISCUSSION

Results of the study revealed that the incidence of POCD in elderly patients who experienced an orthopedic surgical procedure was in accordance with existing published studies. The findings of the neuropsychological tests demonstrated that the performance of POCD patients progressively deteriorated on days 3, 7 and 30 in comparison with performance at baseline. Baseline performance was measured using DECO (Détérioration Cognitive Observée) whereby caregivers fill out an informant questionnaire to establish changes in cognitive performance. Earlier clinical validation reports have evidenced this tool to be extremely sensitive to initial alterations in cognitive operation because of several reasons (Ritchie & Fuhrer, 1995).
The International Study of Post-Operative Cognitive Dysfunction 1 (ISPOCD 1) projected the general incidence of POCD to be 25.8% after one week and 9.9% three months following surgery. Moller and his colleagues (1998) unequivocally confirmed that anesthesia administered for surgical procedures triggers POCD in ageing patients (long-term) and there is higher risk with increasing age. This study established a similar link, however not substantial because the data supplementing an inclination in that direction was obtained from a sample size of only 30 participants. A bigger pool of patients could have possibly given better proof to this conclusion.

**Figure 3.** Label in 18pt Arial.

## CONCLUSIONS

In conclusion, as the aged population is increasingly presenting for surgery, there is an increasing need for grazing the surface of its proclivity, aetio-pathogenesis and diagnosis. Further research endeavors ought to stress on explicating the involved mechanisms which contribute to POCD, particularly AD. In future, studies need to be aimed at the development of novel therapeutic agents and also to alter how current regimens are delivered so that the deleterious outcomes in the elderly can be prevented.

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