

Research Assessment #4

Date: October 8, 2020

Subject: Exposure to General Anesthesia and the Risk of Dementia

MLA:

Fuh, Jong-Ling, and Chih-Wen Yang. "Exposure To General Anesthesia And The Risk Of Dementia". *Journal Of Pain Research*, 2015, p. 711. *Informa UK Limited*, doi:10.2147/jpr.s55579. Accessed 8 Oct 2020.

Assessment:

Now that I have my original work proposal, I have begun looking further into related research. My goal is to gather multiple articles discussing case studies over the correlation between anesthesia and increased risk of dementia. I also want to focus on studies that give details of the people involved in the study, specifically their age, if they have had previous operations or have a genetic history related to dementia. The first research article I found is by Chih-Wen Yang and Jong-Ling Fuh, in which they share evidence gathered that about the debate over is anesthetic lead to an increased risk of dementia.

The article begins by explaining the growing importance of this issue by sharing the growing rate of both dementia and surgery. They then go on to share that there is a growing concern over the possibility of anesthetics causing neurological damage, such as memory complications. They state that there has been evidence that shows that "exposure to anesthetic drugs can impair memory, can induce caspase-3 activation, and can increase levels of A β " (Yang 1). The complication with memory caused by anesthetics can thus be explained by the increase in levels of A β . Increased A β levels not only "induce[s] oxidative damage" but also leads to the formation of "insoluble fibers of amyloid plaques"(Yang 1). Upon reading this and the following explanation about the connection between these fibers and AD pathogens, I looked further into this discussion. I found that oxidative stress can have lasting negative impacts such as possible brain cell damage. I found this intriguing because I was wondering if

this specific brain cell damage caused by raised A β levels could possibly affect the memory function. Moreover, I read in a previous research article that memory can be affected by brain damage if the damage is in the area of the brain related to memory. So this new information has me questioning over which area of the brain is specifically affected by the damage caused by increased levels of A β , which are caused by anesthetic usage.

Anesthetics not only affect A β levels, but can also impact tau pathology. Not only was it found that “anesthesia-induced hypothermia has led to tau hyperphosphorylation” but it is also known that A β levels are “dependent on the presence of tau for its neurotoxic properties”(Yang 1). I found this specific piece of evidence interesting because it suggests that anesthesia not only causes an increase in A β levels, but can also lead to an increase in tau hyperphosphorylation. Which then gives increased A β levels its toxic properties that harm the brain and brain cells. As brain cells have a limited capacity for regeneration, I wonder if this kind of damage is irreversible. The severity of this information also has me questioning if anesthesia is the direct cause of this damage or if there are other factors that worsen the prognosis. This information was found using mice, so I am also curious on if the same findings would also apply to human brains, or if alternations would have to be made. If so, what specific alternations to the process would have to be made? It was also found that other “mechanisms other than hypothermia likely play a role in anesthesia-related tau pathology”(Yang 1). This added detail makes me curious about the other possible ways that anesthetics impact tau pathology and if those additional effects are more harmful than hypothermia. Furthermore, the connection with temperature also has me wondering if I should add temperature as a factor in my original work proposal. This knowledge also ties back to my original work question, as I am aiming to discover in what specific conditions does anesthesia impact memory the most and why.

Overall, this article has helped deepen my understanding on the science behind anesthesia effect on the brain. I plan on continuing to look into more research on this topic by focusing on specific factors that accelerate anesthetics' effect on the brain. Moving forward, I will

also use this knowledge to guide me in further research as I gather data and develop my original work.