SNACC
SOCIETY FOR NEUROSCIENCE IN ANESTHESIOLOGY AND CRITICAL CARE

ARTICLE OF THE MONTH

Association of Anesthesia and Surgery During Childhood with Long-term Academic Performance

Glatz P, Sandlin RH, Pedersen NL, Bonamy A-K, L I Eriksson, Granath F. Association of Anesthesia and Surgery During Childhood with long-term Academic Performance. *JAMA Pediatr.* 2017 Jan 2;171(1):e163470

Welcome to the April 2017 installment of the SNACC Article of the Month. Dr. Roderic Eckenhoff is sharing his thoughts on the article mentioned above. In this very recent publication about a cohort study in Sweden, the investigators examined the effect of anesthesia before the age of four on school grades and IQ.

Roderic Eckenhoff is Austin Lamont Professor and Vice Chair for Research in the department of Anesthesia at the University of Pennsylvania Medical School. His research focus has been in the molecular pharmacology of volatile anesthetics. This led to his interest in neurodegenerative disease and, subsequently, to becoming the chief scientific officer for a patient safety initiative on perioperative brain health by the American Society of Anesthesiologists.

We encourage all of our readers to tell us what they think by joining us on the SNACC **LinkedIn** feed, the **Twitter** feed or on **Facebook**.

~Nina Schloemerkemper, MD; Oana Maties, MD and Adrian Pichurko, MD

Commentary

Roderic G. Eckenhoff, MD
Austin Lamont Professor and Vice Chair for Research
University of Pennsylvania Perelman School of Medicine

Over the last 15-20 years, there has been growing concern, even alarm, that anesthesia in the very young causes neuronal injury or developmental alterations that result in learning, cognitive and behavioral abnormalities later in life. This concern was launched by solid basic science studies in rodents, the results of which were reproduced numerous times, now including primates. It should be emphasized that in almost all of these studies, the animals ONLY received anesthesia, and that there did not seem to be a “safe” anesthetic. How, or whether surgery affects the injury is not yet clear, but is, of course, enormously important as all of the clinical studies are of children receiving anesthesia AND surgery. Nevertheless, most retrospective cohort studies have found a subtle, but significant, signal for abnormality (behavioral, learning, IQ, test performance, etc), especially when children have had multiple procedures prior to the age of three or four years. On the other hand, a couple prospective studies have reported largely negative results, perhaps predictable because of the absence of multiple

procedures.

In my view, the Glatz *et al* paper puts everything into perspective. The authors leverage the excellent data collection in Sweden (both medical and scholastic) to test the hypothesis that surgery as a child influences school grades or IQ at sixteen years of age. The power here is in the very large cohort and the meticulous record keeping. The results show that, indeed, having surgery as a child is associated with a decrease in school performance and in IQ, but when placed in context with other factors known to influence cognitive/learning development, the effect of surgery is very small. For example, the effect of being male, or having a less educated mother, are each about 20-fold larger than having had surgery as a child. Similar to other studies, there appears to be a “dose-response” effect with the number of procedures, but interestingly, only having surgery between three and four years of age had a significant association with scholastic performance. Finally, the authors ruled out the possibility that having had surgery was associated with a lesser likelihood of having performance data to compare.

It is important to recognize that this is a POPULATION study. A very small influence at the population level could be caused by large effects in vulnerable subgroups. A priority going forward should be to examine these cohorts more closely, perhaps using genomics, to discern clues for what vulnerabilities might be. Also, the “scholastic performance” or IQ domains may not well reflect the anesthesia/surgery neuronal effects. Some studies suggest that other domains are affected, such as emotional, behavioral and sensory. Thus, while this study is comforting in that it suggests that childhood anesthesia and surgery are associated with very subtle later effects, more work needs to be done!!