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Editorial

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From Basic Science to Clinical Practice: A Call for Comprehensive Anesthesiology

Every once in a while a landmark study comes along challenging assumptions and presenting data that opens a Pandora's box of fascinating evidence as well as concerns. Such a study by Yan Xu, published in the April 2014 Issue of Anesthesiology,[1] demonstrates that subjects under general anesthesia are still able to perceive external stimuli. Prior to Xu's findings, it was thought that patients might receive information under general anesthesia, but not perceive (and use) this information or remember it at any significant level.

As far as remembering the learning and perception which occurred during surgery, Dr. Xu showed that although the perceived information was not shown through behavioral tests to be remembered when the subjects were awakened, there was proof of cellular memory. Furthermore, it can be argued that although there was not evident conscious recall of the information right after surgery, that might be because Ketamine – the anesthetic used in this particular study is known to severely diminish memory recall immediately after surgery and up to months beyond. No recall testing was done days or weeks after Xu's experiment to ascertain if the subjects did indeed consciously remember what they perceived and learned during surgery. Similar studies are being considered which will use different anesthetics to see if perception of external information occurs with them as well.

Many questions arise and this is the beginning of years of careful research – including that taking into account the perception and remembrance of internal stimuli -- most importantly, pain. In the meantime, what can and should clinicians do to minimize possible adverse neuropsychological effects of surgery under anesthesia, while protracted research is being carried out?

The Larger Context: The State of the Science and Practice of Anesthesiology

While the dangers of anesthesia have been well documented, the outstanding efforts of scientists and anesthesiologists in the past decades have made anesthesia increasingly safer.[2,3] Some assumptions of safety, in fact, have resulted in anesthesiologists gradually being replaced by certified nurses or even by machines in the future. Unfortunately, the truth is that anesthesia is not "safe" yet. We don't know how the anesthetics work, nor do we know what the consequences of surgical stimulation are under different levels or types of anesthesia.

We also know very little about the brain, attention, perception, and memory. We don't know what consciousness really is. We often cannot distinguish completely between conscious and unconscious, because the brain doesn't have an on/off switch. The brain isn't a simple binary computer, but rather a highly complex parallel processor.

We do know there are many levels of the mind, and that sensory perception can occur at non-conscious levels, such as in the case of "blind sight". We are learning about the many forms of memory. We're investigating how information is coded, then consolidated into memory – implicit and explicit – and reconsolidated with each new experience. A person can "know" something, but not be able to voluntarily retrieve that information at a certain time. Neuroscientists can't even totally explain pain; but – to paraphrase a renowned legal expert- "we know it when we feel it".

There is robust anecdotal evidence that many patients are aware at various levels, even when under general anesthesia. There is also evidence of psychic trauma (often manifested as post-traumatic stress disorder, PTSD, after anesthesia) caused by operative and perioperative experiences. PTSD can continue for years in various cognitive forms such as dreams, unexplained anxiety, flash-backs and somatic complaints.[4] On the positive side, studies have shown that listening to music could reduce sevoflurane requirements, and patients who listen to soothing music and have a positive operative environment have better post-operative outcomes.[5,6]

Summarizing Some of the Problems and Further Directions for Research

Dr. Xu's study confirms that the brain is able to perceive and record information from external stimuli under adequate depth of anesthesia. However, the stored novel information was not shown to be recalled behaviorally by most subjects (the behavior of a few subjects was not conclusive) immediately after recovery from anesthesia. The research also shows that perception does not have to come through the thalamocortical route in the brain as proposed by earlier researchers. This important study has significant scientific and clinical implications across multiple disciplines including anesthesiology, clinical psychology, cognitive science, neuroscience, behavioral psychology, and biophysics.

Many questions remain. For example, would the subjects be able to recall the stored information (especially traumatic information of a surgical cut and its associated pain and various stressors during the perioperative period) one week or a month from the surgery when the memory blocking effects of the drugs wear off? Can EEG studies confirm the perceptual findings? How does "molecular memory" work? Do different anesthetics create different perceptual schemas? It is notable that ketamine was the main drug used in this study. Does ketamine allow the external stimuli to be recorded into molecular memory? Can propofol and inhaled anesthetics block perception and/or recording of external stimuli? Is ketamine a potential drug to block the perceived information from being recalled later on? And finally, intraoperative awareness has been reported in the use of both intravenous and inhaled anesthetics? Is there any way we could totally prevent such mishaps?

What Clinical Procedures and Training can Be Implemented Immediately?

Given the many questions and concerns surrounding Yan Xu's and other recent research, clinicians can't wait passively for years of research to be carried out while proposed bureaucratic shortcuts even further threaten the care of our patients. What can we do now?

We suggest that anesthesiologists create a system and protocol

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that minimizes harmful effects from the recorded memory under so-called "adequate anesthesia "or even "inadequate depth of anesthesia" during surgical procedures. A system where experienced anesthesiologists, equipped with psychological intervention capabilities, assure patients preoperatively as well as carry out precise patient follow-up in a week, a month, six months, and a year following surgery. We suggest that anesthesiologists be proactive in making sure the operating theater is a positive environment– for example, have the physicians, nurses, and other perioperative personnel purport themselves as if the patient were conscious. A setup where the patient can listen to customized pleasurable music (in one ear only) could be very helpful. And it is essential to have EEG and other neurological monitors along with the cardiac monitors.

Specifically, anesthesiologists could take the lead in preoperative cognitive priming as well as long term follow-up of patients, asking the correct psychological questions and watching for any signs of post-traumatic stress, anxiety, or somatic distress from the surgical experience. The importance of placebo/nocebo effects has been well documented for over a century. Patients come into surgery frightened and feeling helpless. Too often the surgical arena is unnecessarily dehumanizing. Just a few moments of personal rapport and positive suggestion from an esteemed, trusted doctor can give the patient hope and prime the patient to participate in the healing process. It literally can be "life-saving." For example, the anesthesiologist can cognitively prime the patient by saying something like: "Just remember, your body is very wise. Your heart knows when to beat without your having to tell it. Your finger knows how to heal from a cut if taken care of properly. Trust the wisdom of your body to protect and to heal itself." Suggestions could also be worded to reframe any possible discomfort or hearing of unfamiliar sounds that may occur during surgery. This author (Shanor) already routinely practices this type of cognitive priming for patients prior to surgery and the anecdotal outcomes are strongly positive. Systematic studies are needed to confirm such beneficial effects, which may create a novel subspecialty of perioperative psychology. Instead of inviting psychologists to be in the perioperative arena routinely, it's preferable to train present as well as the next generation of anesthesiologists to have the capability for basic cognitive priming, as well as emotional and cognitive follow-up, and to learn how to best establish a strong bond between anesthesiologists and patients. A favorable outcome for both sides.

The anesthesiologist, focusing neurologically, is uniquely qualified to be the frontline doctor before, during, and even months after surgery - providing a continuity of personal interaction, monitoring, and care that will optimize the medical outcome of the surgery as well as the ongoing health of the patient.

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References

1. Samuelsson AR, Brandon NR, Tang P, Xu Y. Cellular registration without behavioral recall of olfactory sensory input under general anesthesia. Anesthesiology. 2014 120(4):890-905.

2. Staender SE, Mahajan RP. Anesthesia and patient safety: have we reached our limits? Curr Opin Anaesthesiol 2011;24:349-53.

3. Liu R, Garcia PS, Fleisher LA. Interest in anesthesia as reflected by keyword searches using common search engines. J Anesth Clin Res 2012;3.

4. Aceto P, Perilli V, Lai C, Sacco T, Ancona P, Gasperin E, Sollazzi L. Update on post-traumatic stress syndrome after anesthesia. Eur Rev Med Pharmacol Sci 2013;17:1730-7.

5. Sven-Olof Trangeberg O, Stomberg MW. Listening to music during regional anesthesia: patients' experiences and the effect on mood. J Perianesth Nurs 2013;28:291-7.

6. Koelsch S, Fuermetz J, Sack U, Bauer K, Hohenadel M, Wiegel M, Kaisers UX, Heinke W. Effects of Music Listening on Cortisol Levels and Propofol Consumption during Spinal Anesthesia. Front Psychol 2011;2:58.