Freud and Anesthesia – An essay

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Sigmund Freud's contribution to psychoanalytic theory is well recognized by both the medical community and the general non-medical population. However, the large majority of medical professionals are unaware of his contributions to the fields of neurology, histology, anatomy and anesthesia [1].

Freud began his research in the neurosciences with a study on the phylogenetic association between the central nervous system of lower vertebrates and humans. Using crayfish, he demonstrated that nerve fibers originate from a web-like substance in the neurons and that this structure is always fibrillary. Freud also introduced the use of the gold chloride technique to stain nerve structures. He described the structure and function of the medulla oblongata and the connection between the posterior columns of the spinal cord, the acoustic nerve and cerebellum. He also wrote four major texts describing neurologic disorders such as aphasia and cerebral paralysis in childhood. He also published the first analytical and scientific research on cocaine and was the first investigator to predict its use as a local anesthetic.

However, Sigmund Freud gained universal recognition following his discovery and reporting of the existence of an unconscious mind, referred to in the popular literature as the subconscious, a dynamic world of thoughts, fears and behavior that exists in all individuals below the surface of their conscious minds. There is no regular access to this part of the mind, but it reveals itself in a flamboyant charade in dreams. For many years this was considered the main window to the individual's unique inner life. The entire process of psychoanalysis is the exploration of unconscious desires and fears.

The importance of the unconscious was admitted also by Jung. The main disagreement between them was Jung's belief that there was more to the unconscious than Freud theorized. Jung held that there were fears, behaviors and thoughts that children and adults exhibit that are remarkably similar across time and culture. He believed that this was more than simple coincidence and represents a "reservoir" of our experiences as a species – a kind of knowledge we are born with like a "psychic inheritance" – and called it the *Collective Unconscious*. On the other hand, according to Jung's theory, there is a second component of the unconscious, the *Personal Unconscious*, that is composed of memories that are painful and repressed, as well as unimportant memories that have been simply dropped from awareness. The Personal Unconscious holds parts of the personality that come to consciousness [2].

Jung recognized the existence of a hidden memory (cryptomnesia), which can be compared to implicit memory. Cryptomnesia, a technical term from French scientific literature, is defined as the psychic process in which an automatic creative force causes lost memories to reappear in sizable fragments and with absolute clarity. The reappearance of long-forgotten impressions can be explained by the physiology of the brain, which never forgets any impression no matter how slight. Under special conditions, old memories can emerge with almost photographic fidelity [3].

This essay is a proposal to find a common pathway of two different issues: the subconscious and unconscious of Freud and Jung, and hidden memory learned during anesthesia.

Anesthesia and the unconscious mind

Anesthesia causes a unique interplay between the conscious and the unconscious mind. In daily clinical practice anesthesiologists are satisfied that anesthesia produces a total loss of both sensation and consciousness. Do we have good reason to cast doubt on this concept?

Hughlings Jackson assumed that there is no such entity as consciousness, but rather that consciousness varies from moment to moment [4]. Consciousness could also easily fluctuate during anesthesia. We have no real objective measure of this activity in the brain, but we assume that anesthetic agents produce a shift from consciousness to oblivion, bypassing the unconscious mind.

The natural expectation of all anesthesiologists is that patients awaken from anesthesia oblivious of all events that have taken place during surgery, without any memory or awareness of

discomfort. This is the magic that we have come to expect from these chemical substances. But do patients really wake up from anesthesia without retaining any information generated during the course of surgery? The literature is controversial on this issue, but absence of evidence is not evidence of absence [5]. In terms of memory, there are two possibilities concerning events that may occur during general anesthesia.

The first is true awareness or *explicit memory*, which means complete recall of the events occurring during anesthesia. True awareness can be illustrated by the following case. A patient underwent saphenous vein stripping. Shortly after the operation, in the postoperative anesthesia care unit, she was fully awake and demanded to see the surgeon immediately. The surgeon came in due time and asked what was wrong. The patient reported that she felt everything during the operation. "It was a horrible experience" she said, "I had terrible pains, wanted to scream or somehow to tell someone that I wasn't asleep, but I couldn't because I was unable to move a finger and I had something in my throat. I was fully awake!"

Evidence suggests that transmission of information during anesthesia requires a minimum contribution from the brain's arousal system, therefore patients should be protected from all sources of information that might further reduce their morale.

Usually, true awareness occurs because of equipment failure or human error during the delivery of anesthesia. This is also the explanation that appears in medical defense journals. Apparently this is a transitory phenomenon eventually forgotten by the patients. However, depending on the patient's inner strengths, past history and general resourcefulness, the implications can be much more serious. This patient may present for psychiatric care months later with all the stigmata of a major depressive illness, including excessive irritability, insomnia, nightmares, bubbling anxiety, an overwhelming sense of impending doom and a preoccupation with death – all signs of the well-known post-traumatic stress disorder.

Implicit memory during general anesthesia

The above case is representative of obvious aspects of awareness during general anesthesia. However, traumatic events that are retained in the unconscious have far more profound and often inexplicable effects on the patient's psyche. This world of *implicit memory* is an area of major concern for anesthesiologists. Implicit memory is defined as performance or behavior that is modulated by prior experiences or tests and does not require a conscious, intentional recollection of these events.

During clinically adequate anesthesia the brain is still capable of receiving auditory stimuli and processing them at a fairly complex level [6,7]. Unlike stimuli that arise in the spinal cord and cross over to the opposite cerebral hemisphere, hearing crosses twice. It is the first sense to develop, starting at 28 weeks of gestational age. Hearing continues during sleep and while in a state of coma. Fischgold [8] reported changes on a flat electroencephalographic record of a comatose child every time his mother called him. The child died a few hours after the examination. Those changes were not recorded when he was called by the physician. This phenomenon was confirmed every time it was assessed during the process of dying. In relation to this child, Fischgold concluded that "it was clear that this comatose child distinguished clearly between his mother's voice and mine."

The phenomenon of hearing while in a coma was confirmed recently by Stoeckel et al. [9] who described the case of a patient who remained in a coma for several weeks, and upon regaining consciousness described conversations, sounds and noises perceived during the coma. Oppenheim-Gluckman and co-workers [10] assumed the existence of a persistent unconscious psyche during coma and in the early period after awakening from a coma.

Research on implicit memory during anesthesia is not new. In the mid-20th century, studies on perception, therapeutic suggestions and a response to crisis during general anesthesia were published in the medical literature [10–12]. Tunstall [13], using an isolated arm technique, demonstrated that patients undergoing a cesarean section under general anesthesia were able to hear and obey orders without any recollection of having done so after regaining consciousness. More recently, Gidron and colleagues [14] studied the ability of patients to recall words or word associations given repetitively during anesthesia, and proved that many patients could adequately recall them when the depth of anesthesia was based on clinical signs only, but had reduced recall when the level of anesthesia based on cortical electrical activity monitoring was more profound.

The literature on perception during general anesthesia ranges from bizarre reports to controlled studies. Cheek [15] described the case of a patient who underwent gastrectomy with general anesthesia. Cardiac arrest occurred as the stomach was being removed from the abdomen. Before the surgeon began cardiac massage he requested that the patient's husband be informed of the emergency, but no one knew where her husband was. At this point, the patient woke up and whispered around the endotracheal tube: "John's in the lobby." Amazingly, after regaining consciousness, she did not recall this experience.

Evidence for the presence of unconscious memory during general anesthesia has been assessed in many controlled studies. In a randomized controlled study, Bennett et al. [16] demonstrated that patients exposed to an intraoperative suggestion about the importance of touching their ears during the postoperative interview touched the ears more frequently than control patients not submitted to this suggestion. Interestingly, the patients were completely amnesic about the suggestion, even under hypnotic recall.

Bonebakker and collaborators [17] showed that anesthetized patients process information presented during surgery. Jelicic

et al. [18] demonstrated that information processing during anesthesia also takes the form of unconscious learning. A more recent study [19] showed that learning during anesthesia occurs during, rather than before, surgical stimulation at comparable depths of anesthesia. Surgical stimulation appears to facilitate learning during anesthesia unrelated to the depth of anesthesia.

What are the implications of implicit memory? Surgery *per se* is known to cause stress. Sleep disturbance and occasional depression are well known postsurgical phenomena. Untoward events and the devastating power of words spoken during surgery can dramatically alter patients' lives [20].

The power of words spoken during general anesthesia is illustrated by the following case. A 62 year old patient was referred to one of the authors (B.L.) because of an anxiety state with obsessive negative ruminative thoughts about his state of health. He was convinced that he had a lung disease that would shorten his life expectancy dramatically. He went from physician to physician with this complaint, but repeated clinical examinations and ancillary diagnostic tests were normal. In spite of this he continued in his "delusion." Under hypnosis the patient regressed to an operation performed on his chest some years earlier and reported hearing the surgeon say to his assistant: "Look how black that lung is! Have you ever seen anything as black as that?" A phone call to the surgeon confirmed that they had, in fact, been surprised at how dark the lungs were.

Clinical impact of implicit memory under general anesthesia

There are published reports of trials that tested the power of words during general anesthesia to improve the postoperative course. In 1961 Pearson showed in a double-blind study [21] that patients who were presented a positive suggestion by tape recording during general anesthesia had a shorter hospitalization period than patients who were presented music only or no sound at all. Similar results were reported by Bonke and co-workers [22], who demonstrated that patients above the age of 55 who were exposed to a positive suggestion during general anesthesia for biliary tract surgery had a shorter postoperative stay in the hospital than those exposed to noise or operating theater sounds. The clinical value of therapeutic suggestion during general anesthesia was assessed in a double-blind randomized manner [23] in 39 unselected patients allocated to suggestion (n=19) or control (n=20) groups who were played either recorded therapeutic suggestions or a blank tape, respectively, during hysterectomy. The patients in the suggestion group spent significantly less time in the hospital after surgery, had a significantly shorter period of pyrexia, and had a better recovery.

Implicit memory and Freud's theories

Freud joined Breuer in treating their famous patient, the young Anna O, a 21 year old woman who was defined as "the virginal instance of psychoanalytical diagnosis" [24]. Anna O. complained of paralysis of the right arm, blurred vision and difficulty swallowing. Under hypnosis a related childhood trauma was revealed (the death of her beloved father). The psychoanalysts explained the nature of the symptoms to her and eventually she recovered [25].

Now let's take a completely different case. A 65 year old man came to a psychiatrist with a high level of anxiety. He said that he was hearing voices and felt that he would not come through the crisis. Under hypnosis his story became clear. Some months earlier he underwent a lumbar sympathectomy under general anesthesia. During surgery the surgical team discussed the possibility that the leg would have to be amputated. Anesthesia was considered completely uneventful and the patient could not recall any event from his stay in the operating room. However, he stored subliminal information as an expression of implicit memory. The nature of his complaint was explained to him, he improved quickly and all his symptoms disappeared.

The analogy between the two cases is striking. Both patients accumulated negative experiences during traumatic episodes and in both situations the externalization of the pathologic condition took the form of a complex of clinical symptoms. In both cases the patients were completely unaware of the true cause of their complaints and only treatment under hypnosis revealed the cause and led to a solution of the problem.

The so-called Operating Room Etiquette is to be respected. OR personnel must refrain from referring to anesthetized patients as if they were not present.

We are all bombarded by stimuli. Much of it is trivial, innocuous, totally familiar and can be attentuated by the natural sensory mechanisms of our brain. When the stimuli are threatening or in any way ominous they can be responded to or stored away in the unconscious mind. Sometimes this information is so threatening or frightening that it is repressed and kept hidden. This is a protective mechanism to save the individual from painful thoughts. In excessively threatening situations – and the operating theater could certainly fall into this category – the patient could be hyper-aware and pay attention intently, in fact so intently that apparently unimportant sounds may become frightening. A sudden silence or the loud clatter of a tray on the floor could create a startle effect. Unguarded words are latched on to and held. The patient wakes, feels comfortable and is happily unaware of anything that has transpired. This unfortunately may only be the tip of the memory iceberg. Evidence is mounting that information can be heard, stored away, and may influence patients at all levels of their lives.

Factors influencing our knowledge about implicit memory during anesthesia

We do not know the exact magnitude of the sub-clinical (subliminal) effects of implicit memory during general anesthesia. There are various reasons for this lack of information. First, the average patient is not aware of possible associations between

his/her complaints and the surgical/anesthetic procedure. Second, the anesthesiologist does not usually visit his/her patients in the immediate postoperative period and has no way of knowing about their complaints. Third, recall assessment is not part of the postoperative routine. In addition, the use of benzodiazepines, either as pre-medication or during induction of general anesthesia, could impair the ability of the patients to recall information retained during anesthesia.

Hypnosis was thought to be a means to measure, at least partially, the magnitude of the problem. As in Freud's famous case, hypnosis can uncover, postoperatively, intraoperative information stored during anesthesia as implicit memory [26]. Unfortunately hypnosis has been shown to uncover information that may be inaccurate. In 1985 a panel of the council of Scientific Affairs of the American Medical Association declared that "recollection obtained during hypnosis can involve confabulations and pseudo-memories and not only fail to be accurate, but actually appear to be less reliable than non-hypnotic recall" [27].

The same guidelines established that the use of hypnosis with witnesses and victims could have serious legal consequences when testimony is based on material that is elicited from a witness who has been hypnotized for the purposes of refreshing recollection. In addition, even if postoperative hypnosis could obtain information stored as implicit memory during surgery under general anesthesia, the required workload would prevent this method from becoming the gold standard.

Conclusions

Physicians are trained to interact with patients in the most caring therapeutic manner. This high standard of care should not be set aside simply because we believe that our patients do not hear us. They are listening. Can this situation be remedied by deepening the state of anesthesia? Can hearing be blocked with newer chemical agents or a combination of agents? To date there are no unequivocal answers to these questions. Until we have clear answers to these it would be prudent to assume that patients are listening and storing our words in their unconscious mind.

Can we prevent the harmful effects of implicit memory? Many surgeons and anesthesiologists have already carefully structured the operating theater to make it less frightening. Frequently silence is observed, music is played and unnecessary talk is avoided during surgery.

Had Freud not conceived of this amazing, secret storehouse of the mind that is constantly awake and listening, it would surely have been discovered by present-day anesthesiologists in their endeavor to explain the mystery of implicit memory.

References

1. Galbis-Reig D. Sigmund Freud, MD: Forgotten contributions to neurology. *Int J Neurol* 2003;3:1–12.
2. Fairbairn W. Review of psychological reflections: an anthology of the writings of C.G. Jung. *Int J Psychoanal* 1955;36:362.
3. Jung C. Cryptomnesia. In: Jung C, ed. Collected Works of C.G. Jung. Princeton, NJ: Princeton University Press. 2nd edn. Vol 2. 1970:95–106.
4. Jackson JH. On the nature of the duality of the brain. In: Taylor J, ed. Selected Writings of John Hughlings Jackson. Vol 2. London: Hodder and Stoughton, 1932:129–45.
5. Hartung J, Cottrell JE, Giffin JP. Absence of evidence is not evidence of absence. *Anesthesiology* 1983;58:298–300.
6. Van Hooff JC, De Beer NA, Brunia CH, et al. Information processing during cardiac surgery: an event related potential study. *Electroencephalogr Clin Neurophysiol* 1995;96:433–52.
7. Cheek BD. Unconscious perception of meaningful sounds during surgical anesthesia is revealed under hypnosis. *Am J Clin Hypn* 1959;1:101–13.
8. Fischgold H, Arfel G. Observation and experimentation in electroencephalography. *Actual Neurophysiol (Paris)* 1964;24:229–46.
9. Stoeckel J, Ueber ML, Schurder C, Fritsch M, Porchela R. Talking to an "unconscious" patient? *Agressologie* 1993;34 (Spec No 3):156–8; discussion 159–60.
10. Oppenheim-Gluckman H, Fermanian J, Derouesne C. Conscious, unconscious and not conscious in coma. *Agressologie* 1993;34 (Spec No 3):147–50.
11. Levinson BW. States of awareness during general anaesthesia. Preliminary communication. *Br J Anaesth* 1965;37:544–6.
12. Abramson M, Greenfield I, Heron WT. Response to or perception of auditory stimuli under deep surgical anesthesia. *Am J Obstet Gynecol* 1966;96:584–5.
13. Tunstall ME. The reduction of amnesic wakefulness during caesarean section. *Anaesthesia* 1979;34:316–19.
14. Gidron Y, Barak T, Henik A, Gurman G, Stiener O. Implicit learning of emotional information under anesthesia. *Neuroreport* 2002;13:139–42.
15. Cheek BD. What does the surgically anesthetized patient hear? *Rocky Mt Med J* 1960;57:49–53.
16. Bennett HL, Davis HS, Giannini JA. Non-verbal response to intraoperative conversation. *Br J Anaesth* 1985;57:174–9.
17. Bonebakker AE, Bonke B, Klein J, et al. Information processing during general anesthesia: evidence for unconscious memory. *Mem Cognit* 1996;24:766–76.
18. Jelicic M, De Roode A, Bovill JG, Bonke B. Unconscious learning during anaesthesia. *Anaesthesia* 1992;47:835–7.
19. Deeprose C, Andrade J, Varma S, Edwards N. Unconscious learning during surgery with propofol anaesthesia. *Br J Anaesth* 2004;92:171–7.
20. DeLappe A. Shhh! "Sleeping" OR patients are listening. AORN J 1974;19:1334–5.
21. Pearson RE. Response to suggestions given under general anesthesia. *Am J Clin Hypn* 1961;4:106–14.
22. Bonke B, Schmitz PI, Verhage F, Zwaveling A. Clinical study of so-called unconscious perception during general anaesthesia. *Br J Anaesth* 1986;58:957–64.
23. Evans C, Richardson PH. Improved recovery and reduced postoperative stay after therapeutic suggestions during general anaesthesia. *Lancet* 1988;ii:491–3.
24. Ramos Sde P. Revisiting Anna O: a case of chemical dependence. *Hist Psychol* 2003;6:2239–50.
25. Grubrich-Simitis I. Primal psychoanalytic manuscript. 100 years "Studies of Hysteria" by Josef Breuer and Sigmund Freud. *Psyche (Stuttg)* 1995;49:1117–55.
26. Jelicic M, Bonke B. Auditory perception during general anesthesia: psychologic consequences. *South Med J* 1989;82:1220–3.
27. Scientific status of refreshing recollection by the use of hypnosis. Council on Scientific Affairs. JAMA 1985;253:1918–23.

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