Awareness During Anesthesia and Posttraumatic Stress Disorder

Janet E. Osterman, M.D., and Bessel A. van der Kolk, M.D.

Abstract: It has been estimated that approximately 30,000 patients a year suffer awareness or consciousness during anesthesia. This paper reviews existing knowledge of the psychological impact and psychiatric sequelae of awareness during anesthesia. Literature on awareness and memory during anesthesia, traumatic memory, and posttraumatic stress disorder (PTSD) was reviewed using computer searches, books, and referenced articles. Few case reports of awareness have identified the accompanying psychological trauma and resulting PTSD. Five published cases illustrating relevant material were selected for inclusion. Waking up during anesthesia, especially if the patient experienced pain, is a traumatic event which places the patient at risk for developing PTSD. Awareness-induced PTSD must be considered for patients who present for mental health treatment following surgery. The advantages of light anesthesia must be balanced against the risk of awareness-induced PTSD. © 1998 Elsevier Science Inc.

Introduction

Awareness during anesthesia or consciousness under anesthesia has been long recognized as a potential complication of general anesthesia [1–9]. It is estimated that in the United States approximately 30,000 patients a year suffer awareness during anesthesia [10]. Morton’s introduction of ether in 1846 heralded the advent of a surgical era in which patients could be relieved of the distress of undergoing surgery while conscious. In that same year, Morton described the first case of awareness during general anesthesia when his etherized patient experienced intraoperative pain [1,5]. Prior to the use of curare, awareness was readily detected since the patient would exhibit a motor response to painful surgical stimuli [4].

The introduction of muscle relaxants in 1942 led to safer anesthesia but raised the possibility that patients might experience intraoperative pain while unable to alert the surgeon or anesthesiologist to their plight [1–8]. The first case report of awareness during general anesthesia using curare was in 1950 by Winterbottom [11]. His patient reported her experience on the third postoperative day:

I was awakened by the most excruciating pain in my tummy. It felt as if my whole inside were being pulled out. I wanted to cry out or otherwise indicate my suffering, but I couldn’t move any part of me.

The surgeon’s response:

[T]he memory about which the patient spoke subsequently was of severe pain, but she spoke of it as a matter of interest rather than concern. It would be the greatest error to leave the impression that she sustained any serious psychological trauma [12].

In 1961, prior to the introduction of PTSD as a diagnosis, Meyer and Blacher [13] observed that patients who awakened from anesthesia during cardiac surgery while paralyzed with succinylcholine suffered from a traumatic neurosis with common symptoms being repetitive nightmares, generalized anxiety, irritability, and a preoccupation with death. The profound state of helplessness with the patient’s belief that something had gone wrong was implicated in the development of the traumatic neurosis. In 1964, Cheek [14] reported patients’ experiences of awareness, noting that although none reported intraoperative pain, they were much trou-
bled by feelings of being incapable of moving and by the fear of experiencing pain.

Published Cases

Case 1

Moerman et al. [15] reviewed 26 patients who experienced some degree of awareness with a time interval from surgery to interview of a few days to 19 years. In this study, 70% of the patients who experienced any awareness had psychological sequelae including sleep disturbances, dreams and nightmares, flashbacks, and anxiety. The authors noted that pain during anesthesia was commonly reported by patients with distressing after effects. For example, a woman suffered psychological distress following painful awareness during an emergency Cesarean section where she believed she was not being taken care of and that she was dying.

Case 2

Goldmann et al. [16], in a study of 30 cardiopulmonary bypass surgery patients, found seven with recall of intraoperative events. All seven patients were noted to have high postoperative anxiety. When interviewed about their surgery they became autonomically aroused, but only 29% had a narrative memory of their awareness experience. Hypnosis allowed the remaining 71% to tell a story of what happened. One man described his leg being cut, hearing voices, and feeling as if he “wasn’t going to pull through it.” This patient became flushed and uncomfortable and spontaneously terminated hypnosis, restoring his amnesia for the intraoperative events. This illustrates how patients will go through great lengths not to consciously recall their trauma.

Case 3

MacLeod and Maycock [7] described three patients who were diagnosed with PTSD following awareness during anesthesia. One patient was a 33-year-old nurse who felt the incision of her emergency Cesarean section along with a sensation of not being able to breathe, hearing incomprehensible voices, feeling helpless, and believing she was dead. She reported she was not distressed by this until exactly 1 week had elapsed since her surgery. She developed flashbacks with concomitant signs of anxiety, nightmares, initial insomnia, and difficulties in managing her usual responsibilities. Another case was a 39-year-old woman who had “painful searing” sensations during a laminectomy and encountered denial of this by the medical staff. Two years after surgery she was still tormented by persistent intrusive thoughts of her surgery, nightmares, easy startle, impaired memory and concentration, and initial insomnia.

Case 4

Tunstall and Lowit [17] presented a case of a woman who suffered from recurrent nightmares and insomnia after experiencing awareness during general endotracheal anesthesia for a Cesarean section. The patient recalled feeling the pain of the incision and hearing the anesthetist remark about her blue color, feeling she had “had it” but was unable to move to alert anyone. She suffered disability for many years including sleep disturbances, nightmares, and panic with a “sinking feeling” when lying on her back. Her symptoms improved dramatically following a restorative experience during elective surgery 6 years later when she was able to communicate her level of comfort with the use of right forearm isolation and induced wakefulness.

Case 5

Guerra [2] noted that the response of the anesthesiologist to the patient’s reported experience can significantly affect the patient’s long-term adaptation. For example, a 35-year-old woman awakened during her vaginal hysterectomy to a “pulling” sensation in her vagina and lower abdomen, but without pain. Her main concern was that she felt out of control and was unable to communicate her condition to anyone. When told postoperatively that it was impossible for her to have been awake, she became tearful and enraged. She felt, once again, that she was unable to communicate with her doctor which was a repetition of her trauma.

Awareness and PTSD

These cases illustrate the traumatic nature of awareness during anesthesia and subsequent symptoms of PTSD. Posttraumatic stress disorder is characterized by three symptom clusters: 1) reexperiencing, 2) avoidance and numbing, and 3) increased arousal which follows a traumatic event [18]. Case 4 illustrates the role of sensory reminders (i.e., lying
on her back) in causing reexperiencing symptoms (panic and a “sinking feeling”). Common symptoms noted in these cases include insomnia, nightmares or recurrent distressing dreams, flashbacks, intrusive thoughts, and hyperarousal. Cases 2 and 3 demonstrate amnesia, with the patients in the Goldmann et al.’s [16] study having memory only under hypnosis and the woman described by Macleod and Maycock [7] having no recall until the 1 week after her surgery.

In an ongoing study of this population we have found significant complaints of insomnia, specifically avoidance of going to sleep, with subjects describing reexperiencing symptoms, including flashbacks of paralysis and terror, triggered by the process of falling asleep. Some subjects reported flashbacks of pain when in a state of light sleep or with cues that symbolize or resemble their trauma. Several subjects reported intense fear responses, flashbacks, and intrusive thoughts when seeing the color blue (a common color for scrub suits and operating room drapes), television programs with hospital themes, sounds (such as clinking silverware), or smells (rubbing alcohol, perfume). Two thirds of the subjects recruited for our study developed panic after making appointments for hospital-based interviews, and canceled their appointments. We were forced to abandon hospital-based interviews and instead meet in “neutral” settings.

Memory in Anesthesia

The question of whether people can absorb new information while under anesthesia has led to extensive exploration of nontraumatic memory functions in the anesthetized patient [19–38]. This area of research was stimulated by Levinson’s 1965 report that 80% of patients who had been deeply anesthetized had memory of a mock surgical crisis when hypnotized 1 month postoperatively [19]. Fifty percent of those with recall were able to reproduce almost precisely the words spoken during the mock crisis.

Subsequent reports noted that certain intraoperative comments may have harmful effects [14,38] whereas others can be therapeutic [20–24]. Negative comments were reported to adversely affect patient outcome [16]. Therapeutic effects of positive statements have been equivocal, with some reports noting decreased hospital stays [21] or decreased need for pain medication [22] whereas others noted no effect on therapeutic outcome [20,23,24].

Several studies addressed the roles of implicit and explicit memory during anesthesia [25–37]. Implicit memory is defined as a form of memory in which the patient has no conscious recall but exhibits memory through responses, skills, actions, or emotions; explicit memory is synonymous with conscious memory. Implicit memory has been studied using commands given intraoperatively, such as instructing a patient to pull his/her ear or touch his/her nose [25–28] or by implicit memory tests such as word associations or sentence completion [25,28–37]. Some of these studies were able to demonstrate the existence of implicit memory [25,26,29,31] but others did not [27,28,30,32–37].

Memory and Trauma

Until now, the paradigm of the studies of memory during anesthesia have been based on technology developed for laboratory procedures that do not take into account how memory changes according to the level of emotional arousal. Tests, such as word association or sentence completion, do not measure how, following trauma, previously neutral sensory stimuli can come to trigger unwanted intrusions of trauma-related sensory stimuli.

Memories of traumatic experiences are qualitatively different from memories of everyday events and are characterized by having a substantial sensorimotor or affective quality with sometimes little or no narrative component [39–41]. Unlike smells, colors, sounds, or other sensory stimuli that trigger sensory stimuli, word tests, such as sentence completion or word associations, are not optimal tests for implicit memory [41]. Lang [42] has demonstrated that emotionally laden mental images are accompanied by increased autonomic activity. He proposed that emotional memories are stored in associative networks consisting of sensory elements of the experience that are reactivated when a person is confronted with situations that stimulate a sufficient number of elements making up these networks. Thus, implicit memories are more likely to be recalled with one sensory element stimulating recall of other emotional memories. For example, a woman with only a few isolated memories of her painful awareness experience was in a hospital several weeks postoperatively. She was overcome with feelings of terror and reexperienced feelings of paralysis and helplessness when a hospital employee wearing a blue scrub suit approached her. She was flooded with previously unrealled memories and flashbacks of her trauma including visual, auditory, somatic, cognitive, and emotional states over the
next several weeks. She described this as a “jigsaw puzzle” where she struggled to join random, disconnected fragments into a sequential, orderly narrative in order to make meaning of her traumatic experience.

Simple sensory conditioning may occur without a person being able to make meaning of the personal relevance and historical antecedents of his or her reaction [39]. Thus, a person may react to implicit cues of his or her traumatic experience without explicit memory or conscious awareness of the trauma [40,41]. Indeed, a period of amnesia for some or all of the traumatic events is not uncommon [39–41,43,44–50]. For example, following painful awareness, a woman developed a sudden, intense inexplicable aversion to jazz. She had no memory of music being played in the operating room until almost 5 years following her awareness when she recalled that one of her favorite jazz pieces was played during her surgery.

A person who had a traumatic event may have no access to the affective components of his or her experience and may recount a horrific experience without distress. Posttraumatic dissociation and numbing may contribute to a patient’s apparent lack of distress [39,45–47,51,52]. Additionally, avoidance of reminders of the trauma, such as medical care and hospitals, may prevent patients from seeking aftercare and discussing their awakening with the surgical or anesthesia teams. These psychological responses as well as the fragmentary nature of traumatic memory are leading factors in the underrecognition of awareness-induced PTSD.

Inescapable Stress

Undergoing surgery while conscious of intraoperative stimuli including pain, yet paralyzed and intubated, is an inescapable stress situation. Inescapable stress, as studied in animal models, has been thought to provide a paradigm for understanding the development of PTSD in humans subjected to overwhelming trauma [53–55].

It has been suggested that the inability to take action to terminate the terrifying experience leads to a failure of the normal “fight or flight” response, precluding active coping and increasing the likelihood of passive coping or dissociation [53]. Dissociation at the time of the trauma has been found to be a significant predictor of PTSD [56]. Dissociation causes memory to be organized, at least initially, as sensory fragments and intense emotional states and to interfere with the ability to develop a narrative of the event [46].

Implications For Prevention and Treatment Assessment

In most studies of awareness, patients were asked about explicit memory for intraoperative events within the first 2 postoperative days. During this period patients rarely reported memories [9,24–28,31–34,36,37]. Since semantic memory may not be available for some time following a traumatic event [39–41], inquiry in the early postoperative period may miss those with a traumatic awareness. There may be a gradual emergence of memories and formation of a narrative which will reinforce conscious avoidance of contact with hospitals, surgeons, and other medical care providers.

Patients who had awareness and subsequent psychological complications may never inform the surgeon or anesthesiologist or seek psychiatric help. Blacher [1] noted patients’ resistance to informing the surgical team, with some patients expressing fears of appearing ungrateful or insane. The psychological responses to the experience of awareness as well as the fragmentary nature of traumatic memory may lead to a failure to recognize awareness-induced PTSD.

By the time a patient suffering from awareness-induced PTSD is referred for or seeks mental health treatment, comorbid depression, panic disorder, obsessive-compulsive disorder, agoraphobia, or substance abuse may predominate and be selected for treatment while the diagnosis of PTSD is missed. Additionally, the patient’s emotional distress may be erroneously attributed to the condition that led to surgery, such as a reaction to cancer, a bypass, or a postpartum reaction, further obscuring the identification of awareness and the diagnosis of PTSD. The result may be prolongation of the PTSD and continued dysfunction and disability for the patient.

Assessment for awareness is an ongoing process since these memories may gradually emerge over time. Assessment should begin in the recovery room with the patient being asked if he or she recalled any intraoperative experiences. It seems reasonable to perform a postoperative screen during the standard 7–10-day postoperative visit to the surgeon.

The nursing staff should ask about nightmares, feelings of fear or terror, sleep disturbance, and
intrusive thoughts of the surgery. A patient who acknowledges awareness or who endorses symptoms requires evaluation and possibly treatment by a health care provider with expertise in treating psychological trauma.

**Prevention of Morbidity**

Social support and acknowledgment are the most important long-term protective factors against the development of PTSD [57]. Patients facing surgery need to feel a sense of safety and connection to the surgical and anesthesia teams with maintenance of a supportive care provider-patient relationship, a goal of all operative phases.

Awareness during anesthesia may damage the doctor/nurse-patient relationship. Several reports specifically mention that patients viewed gossiping, joking, and making negative or pejorative comments to be among the most distressing aspects of their awareness experience [7,16,38,58,59]. Patients frequently expressed the wish that someone had spoken to them during surgery, believing that it would have “made all the difference” [58].

PTSD research has shown that when the patient’s internal resources are depleted, external support needs to be mobilized to compensate for their helplessness [57]. Validation by others of the reality of the traumatic event in a safe and supportive context seems to be important for prevention and treatment of posttraumatic stress [60,61]. The surgeon, anesthesiologist, and anesthetist should play a critical role in this process. Their interventions may help the patient view them as allies for recovery rather than perpetrators of the trauma. Special care should be taken not to ascribe blame to the patient or to minimize the impact of awareness.

An important role for the C-L clinician is to assist the surgical and anesthesia teams in acknowledging the reality of the experience and recognizing the emotional impact to the patient.

**Treatment**

The goal of mental health treatment should be to facilitate the emotional processing of the traumatic event and to organize the traumatic memory and the changes in world and self-concepts [62,63]. The PTSD treatment outcome literature clearly demonstrates that supportive or palliative care is insufficient treatment for PTSD and that exposure-based therapies are the treatment of choice [54,64,65]. Patients need to be taught active coping strategies to help with the reintegration of implicit components of fragmented memories.

Psychopharmacology can be a very helpful treatment intervention for PTSD [54,66]. Medications are insufficient as a single treatment modality, but can modulate symptoms of PTSD sufficiently to allow the patient to engage in and benefit from exposure-based therapies [54]. Sedative-hypnotics are indicated for sleep disturbances, and the selective serotonin re-uptake inhibitors have been shown to be helpful in decreasing intrusions and numbing.

No studies on the treatment of awareness-induced PTSD have been done. However, studies with other traumatized populations suggest that treatment strategies where reexperiencing the trauma takes place under safe conditions using exposure-based therapies (cognitive-behavioral therapy) [54,63–65,67–69], prolonged exposure [63,68], flooding [70], or eye movement desensitization and reprocessing (EMDR) [71–74], allow the reprocessing of the traumatic event and integration of the traumatic memories. The therapeutic process allows the patient to acquire an understanding of his or her trauma with the development of a sense of mastery and control over the memories, reestablishment of safety in the world, re-attachment to others, and re-creation of a sense of his/herself which incorporates surviving a horrific experience [63].

**Conclusion**

The advantages of light anesthesia must be balanced against the risk of awareness-induced PTSD and its morbidity. With awareness estimated to occur in 30,000 patients a year in the United States alone, interventions that minimize risk factors for the development of awareness-induced PTSD are critical in the treatment of the surgical patient.

A postoperative assessment is essential since a patient may lack sufficient explicit memory of his or her awareness and be unable or unwilling to inform the anesthesiologist or surgeon, or avoid medical care altogether. Awareness-induced PTSD must be considered for a patient with psychiatric complaints following surgery.

The C-L clinician’s role is to assist the surgical and anesthesia teams in acknowledging the reality of the experience and recognizing the emotional impact of the patient. Validation of the patient’s experience and continued contact and support by
References

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