

Outcome after awareness with explicit recall

R. SANDIN

Abstract : Between 0.1% and 0.2% of surgical patients given general anesthesia remember having been aware during the procedure. Not all, but some of these patients have experienced pain, anxiety or both while being aware. In addition, there is a risk for developing anxiety symptoms. These symptoms can constitute a posttraumatic stress syndrome or parts thereof. The anxiety symptoms may be transient, but can persist in some patients. The majority of available studies on suffering due to awareness are retrospective, and potential selection bias in the studied cohorts should be considered when the likelihood for negative experiences of awareness are discussed.

Key words : Complications ; awareness ; posttraumatic stress disorder.

INTRODUCTION

Three large cohort studies from different parts of the world (e.g. Sweden, Australia, and USA) have demonstrated an incidence of awareness with explicit recall after general anesthesia ("awareness") of 0.1-0.2% (1-3). These results applies to patients without any monitoring of evoked potentials or EEG, even if another group of BIS (Bispectral index) monitored patients were included in the study by SEBEL *et al.* (3). Two recent studies, one historically controlled in a general surgical setting (4), and one randomized in a population considered as being at increased risk for awareness (5), both found a reduced risk for awareness by approximately 80% when BIS was used to guide the conduction of anesthesia. The current incidence of awareness is only 10% or less of what it used to be when the first incidence study was done almost 50 years ago (6).

Even if the incidence of awareness is low, the annual number of patients experiencing awareness is quite high due to the fact that approximately 7% of the populations in several countries require surgery every year. The Joint Commission for Accreditation of Health Care Organizations (JACHO) in the US, in a Sentinel Alert in 2004, estimated the annual number of awareness cases in the US to between 20,000 and 40,000 (7). Even if some persons think

that this estimate is somewhat exaggerated, a considerable number of patients have recollections from their surgery.

Based on available, relevant investigations, the Sentinel Alert issued by JACHO (7) also stated that up to 50% of awareness cases may suffer, not only from pain and panic while surgery is going on, but also from potentially long standing psychological sequel after anesthesia. Persisting psychological illness after awareness may fulfill the criteria of the posttraumatic stress disorder (PTSD) or be restricted to any of the isolated symptoms contained in this diagnosis.

PTSD

The term PTSD was used for the first time in 1980. It originates from non-medical situations such as war experiences, severe accidents or violent crime. It has been estimated that one-third of the more than 100,000 persons directly witnessing the events on September 11 have, or will develop PTSD (8). This syndrome can be elicited by a traumatic event with a severity comparable to threat to life. The ensuing disorder comprise three key features ; 1. *Reexperiencing*, either involuntary while awake or as distressing, repetitive nightmares, 2. *Avoidance*, meaning that things or situations associated with the initial eliciting event are avoided. This is associated with a defect emotional life called "numbing", and 3. *Hyperarousal* which may include sleep disturbances, irritability, and an increased startle response. Finally, a diagnosis of PTSD requires that the symptoms have persisted for at least 1 month. It is suggested that the neuroanatomic basis for PTSD resides in the hippocampus and

Rolf SANDIN, M.D., Ph.D., Department for Pharmacology and Physiology ; Section for Anesthesiology, Karolinska Institutet, Stockholm, Sweden.

Correspondence address : Rolf Sandin, Department for Pharmacology and Physiology ; Section for Anesthesiology, Karolinska Institutet, Stockholm, Sweden.
E-mail : rolfs@ltkalmar.se.

amygdala, structures associated with memory and emotional reaction. Lifetime prevalence of PTSD has been estimated to 8% (9). Among risk factors are the pre-existing psychiatric state, the initial emotional response, and poor social support. Treatment of PTSD includes creating an atmosphere of safety and trust. Additional interventions include cognitive behavior therapy, and eye movement desensitization. Pharmacological treatment by selective serotonin uptake inhibitors may relieve the three main clinical features reexperiencing, avoidance and hyperarousal. Most persons exposed to acute, severe, emotionally charged stress who develop PTSD recover naturally leaving less than 25% to have chronic symptoms (9).

PAIN, PANIC AND PTSD RELATED TO AWARENESS IN DIFFERENT STUDIES

Apart from case reports about outcome after awareness there are at least 6 studies which are frequently cited (10-15), and there is also a not yet published article which provide useful information (16).

In 1984 EVANS put an advertisement in four daily papers asking patients having experienced awareness to respond (10). Among the 33 responses, 27 were considered adequately documented. The awareness experiences dated back a median of 18 years before the investigation, and the average age of the patients for the time of the complication was 35 (4-54) years. Pain was experienced by 41% of the patients and 78% reported fear or panic (Fig. 1). Whereas Evans did not report on late psychiatric problems, 41% of the patients considered awareness to be the worst experience of their life.

In addition to data on immediate pain and panic, detailed data on psychiatric problems after awareness was given in 1993 by MOERMAN, BONKE and OOSTING (11). The 26 patients included in this study were identified by asking the colleagues at the anaesthesiology department of a large university hospital to refer patients known to have suffered from awareness previously. The time between the awareness episode and the interview ranged from hours to 19 years, and the patients were on average 39 (23-65) years old at the time for awareness. MOERMAN *et al.* found that 69% of their patients had experienced unpleasant psychiatric effects after awareness, and 42% still suffered from such symptoms at the time for the interview (Fig. 1). One of their patients developed a phobia, and two others needed psychotherapy. 39% of the patients had experienced pain and 92% reported anxiety or panic

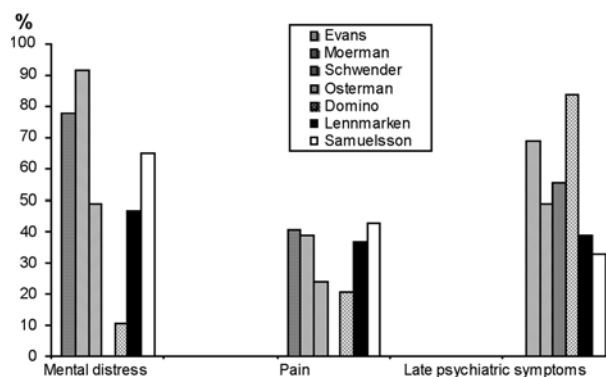


Fig. 1. — Immediate suffering from pain, immediate anxiety and late psychiatric symptoms after awareness. Data are from the references 10-16. It should be noted that the definitions for reporting late symptoms vary in the different studies. The incidence of PTSD is reported as 56% by OSTERMAN (13), 10% by DOMINO (14), 7% by SCHWENDER, and 2% by SAMUELSSON (16).

(Fig. 1). From their own results, and also by looking into the data presented earlier by EVANS (10), Moerman considered pain to be a possible predictor for late psychiatric symptoms. They also mention the possible importance of being aware while unable to move (85%) as a significant contribution to anxiety, and hence, to psychiatric symptoms. No estimate of PTSD according to definition was reported.

Among 45 patients who had suffered from awareness SCHWENDER *et al.* identified 3 patients who had developed PTSD and required medical treatment (12). Another 19 patients had any psychiatric symptom after having been aware. Nearly all of the 49% who had experienced anxiety and fear while awake during surgery described their reaction as severe panic (Fig. 1). Pain, in most cases severe, was reported by 25% (Fig. 1). The patients investigated by SCHWENDER *et al.* were recruited both by the use of advertisement (like EVANS) and by referral (like MOERMAN). The psychiatric symptoms among patients included by the use of advertisement lasted significantly longer compared to those identified by referral. The authors considered that inclusion of persons responding to an advertisement might result in selection bias due to a disproportionate number of “complainers”, i.e. persons with a strong interest in their own medical history.

Osterman *et al.* used both advertising and referral to recruit 16 patients who had experienced awareness, on average 18 years earlier (13). Pain and anxiety were not systematically reported but seems to have been experienced by most of the patients. An incidence of PTSD of 56% was reported albeit the authors comment that the study sample

may not have been representative, and a recommendation to use prospective study designs in subsequent studies was given.

However, another retrospective approach to recruit patients for determining the degree of immediate and delayed suffering related to awareness was used in a study by DOMINO *et al.* (14). By studying 4,183 malpractice claims entered into the ASA Closed Claims Project between 1961 and 1995, 79 cases related to awareness were identified. Female gender was significantly overrepresented and constituted 77% of the claims. The cases had occurred between 1961 and 1995. 21% of the patients had experienced pain, and 11% reported panic. Postoperative, temporary emotional distress was reported by 84%, and a 10% had been assigned a diagnosis of PTSD. The fractions of patients reporting pain and panic were lower in this study compared to the previously mentioned 3 studies, while the risk for psychiatric symptoms after awareness was higher. Methodological issues and potential sources of bias are extensively discussed in the paper.

The only prospective study so far was published by LENNMARKEN *et al.* in 2002 (15). It was based on a previous cohort study in which 18 awareness cases had been identified among 11,785 consecutive patients given general anesthesia (1). All 18 patients had been offered repeated information and supportive counseling immediately after their awareness episodes, and all patients stated within 3 weeks that all their psychiatric problems had resolved. In the follow up study by Lennmarken, all 18 patients were asked to participate in an interview, on average 27 months after the unfortunate anesthetic (15). One patient had died, 2 patients could not be located, and 6 patients declined to participate. Among the 9 patients (50% of the original cohort) who consented to the follow-up interview, four had significant persisting psychiatric problems that did not tend to decrease with time, and two of those required medical therapy. Another 3 patients had some psychiatric problems that had become less severe with time and were possible to cope with in daily life. Thus, in this study, a conservative estimate of the incidence of late psychiatric symptoms is 39%, whereas in the worst case, if only the nine consenting patients are considered, this incidence is 78%. Two of the patients with persisting symptoms conveyed that avoidance was the reason for them to falsely claim that they had recovered soon after awareness.

In an oral presentation at the ASA meeting in Atlanta 2005, SAMUELSSON described another

method for inclusion of patients having experienced awareness (16). 2681 consecutive patients scheduled for GA were interviewed for awareness during previous anesthesia. 46 patients were evaluated after excluding 33 cases which were considered not to have been aware or had been operated under regional anesthesia. Among the patients who had been aware during general anesthesia, 43% had experienced pain, and 65% described an acute emotional reaction. 33% experienced late symptoms, but the severity seemed less intense compared to that in previous studies. Only one patient who had suffered multiple non-medical traumatic events in addition to having been aware during surgery had a diagnosis of PTSD.

INTERPRETATION OF AVAILABLE DATA

Methods for inclusion, definitions for reporting pain, anxiety, and late psychiatric symptoms differ in available studies of patients experiencing awareness during general anesthesia. The most consistent finding across different studies seems to be the fraction of patients, 20-40%, who have been in pain during surgery. The risk for experiencing any late psychiatric problems ranges between 33% and 84%. The only truly prospective study in this field found late psychiatric symptoms in 39% of patients (15). However, the interpretation of this result is difficult since only 9 of the original 18 awareness cases could be enrolled in the follow up interview. A worst case scenario from this study, if the 9 interviewed patients who could be located and agreed to the interview are representative for all 18 initial awareness cases, the incidence of late psychiatric symptoms would be 78%. The fraction of patients fulfilling the PTSD criteria ranges notably between 2% in the yet unpublished study by SAMUELSSON (16) to 56% in Osterman's study. This wide variety may, at least in part be due to methodological reasons which is acknowledged by OSTERMAN. MOERMAN *et al.* assumed that advertising for patients with previous experience of awareness might cause selection bias, and, therefore, they recruited their patients by referral (11). Among their patients 70% suffered unpleasant aftereffects, but the fraction of patients fulfilling the PTSD criteria was not given. SCHWENDER *et al.* explored the assumption that referral might recruit a disproportionate number of "complainers" further. They used both referral and advertising to recruit patients and found a significantly longer duration of delayed psychiatric symptoms among the patients recruited

by advertising (12). Clearly, the 79 patients in the US who had been filing a closed claim due to awareness between 1961 and 1995 are not the only patients who have been aware during this 34-year period. Therefore, the potential for selection bias shown by SCHWENDER may apply also to the 10% incidence of PTSD identified by DOMINO (14). Two of the three PTSD cases in Schwenders study were recruited by advertising. Thus, the incidence of PTSD among their patients recruited by referral was 5%. Samuelsson identified only one patient with PTSD among 46 awareness cases, and this patients sequel was not necessarily caused by awareness only (16). The method for inclusion in Samuelssons study may have contributed to the seemingly less grave mental outcome in this, compared to several previous studies.

Taken together, assessing available results and taking methodological considerations into account it seems like 20-40% of awareness patients experience pain, and approximately twice as many suffer from anxiety or panic during wakefulness. It is even more difficult to estimate the risk for late anxiety symptoms which, however, appears to be around 50%, while the risk for long standing PTSD probably is below 10%.

CONCLUSION

Albeit available studies cannot provide an exact prevalence of pain and anxiety/panic among patients suffering from awareness during general anesthesia, it is clear that a considerable fraction of these patients are in severe distress while awake during surgery. In addition, there is a considerable risk for ensuing anxiety symptoms after awareness, either fulfilling the diagnostic criteria of the post-traumatic stress syndrome or parts thereof. Even if, due to methodological reasons, the risk for long standing anxiety symptoms may be somewhat over-estimated if available retrospective study results are uncritically adopted, this complication is real, and it may change future life for the affected individual.

References

1. Myles P. S., Williams D. L., Hendrata M., Anderson H., Weeks A. M., *Patient satisfaction after anaesthesia and surgery : results of a prospective survey of 10,811 patients*, BR. J. ANAESTH., **84**, 6-10, 2000.
2. Sandin R. H., Enlund G., Samuelsson P., Lennmarken C., *Awareness during anaesthesia : a prospective case study*, LANCET, **355**, 707-11, 2000.
3. Sebel P., Bowdle T. A., Ghoneim M. M., Rampil I. J., Padilla R. E., Gan T. J., Domino K. B., *The incidence of awareness during anesthesia : a multicenter United States study*, ANESTH. ANALG., **99**, 833-9, 2004.
4. Ekman A., Lindholm M. L., Lennmarken C., Sandin R., *Reduction in the incidence of awareness using BIS monitoring*, ACTA ANAESTHESIOL. SCAND., **48**, 20-6, 2004.
5. Myles P. S., Leslie K., McNeil J., Forbes A., Chan M. T., *Bispectral index monitoring to prevent awareness during anaesthesia : the B-Aware randomised controlled trial*, LANCET, **363**, 1757-63, 2004.
6. Hutchinson R., *Awareness during surgery. A study of its incidence*, BR. J. ANAESTH., **33**, 463-9, 1961.
7. Joint Commission on Accreditation of Health Care Organizations, *Preventing, and managing the impact of, anesthesia awareness*, SENTINEL EVENT ALERT., **6** (32), 1-3, 2004 Oct.
8. Yehuda R., *Posttraumatic stress disorder*, N. ENGL. J. MED., **346**, 108-114, 2002.
9. Vieweg W. V. R., Julius D. A., Fernandez A., Beatty-Brooks M., Hettema J. M., Pandurangi A. K., *Post-traumatic stress disorder : Clinical features, pathophysiology, and treatment*, AM. J. MED., **119**, 383, 2006.
10. Evans J. M., *Patients experience of awareness during general anaesthesia*. In : Rosen M., Lunn J. N., eds. *Consciousness, Awareness, and Pain in General Anaesthesia*. London, Butterworths, 1987, pp. 184-92.
11. Moerman N., Bonke B., Oosting J., *Awareness and recall during general anesthesia. Facts and feelings*, ANESTHESIOLOGY, **79**, 454-64, 1993.
12. Schwender D., Kunze-Kronawitter H., Dietrich P., Klasing S., Forst H., Madler C., *Conscious awareness during general anaesthesia : patients' perceptions, emotions, cognition and reactions*, BR. J. ANAESTH., **80**, 133-9, 1998.
13. Osterman J. E., Hopper J., Heran W. J., Keane T. M., van der Kolk B. A., *Awareness under anesthesia and the development of posttraumatic stress disorder*, GEN. HOSP. PSYCHIATRY, **23**, 198-204, 2001.
14. Domino K. B., Posner K. L., Caplan R. A., Cheney F. W., *Awareness during anesthesia : a closed claims analysis*, ANESTHESIOLOGY, **90**, 1053-6, 1999.
15. Lennmarken C., Bildfors K., Enlund G., Samuelsson P., Sandin R., *Victims of awareness*, ACTA ANAESTHESIOL. SCAND., **46** (3), 229-31, 2002 Mar.
16. Samuelsson P., Brudin L., Sandin R., *Severity of Mental Symptoms Due to Awareness*, ANESTHESIOLOGY, **103**, A7, 2005.