Awareness during surgery

Farouk M. Messahel, *DA, FRCA,* ***Ali S. Al-Qahtani,*** *DLO, KSUF(ENT).*

ABSTRACT

Objective: Patients who experience awareness under surgery may suffer from the post-traumatic stress disorder with its long-lasting psychological damage. Furthermore, there are also media attention and legal consequences. In spite of understanding its causes, it is still occurring worldwide and there are no reports of awareness in the Saudi medical literature. This prospective study was conducted to determine the incidence of awareness when its causes are eliminated and to record patient satisfaction.

Methods: Surgical patients >4 years old (ASA I-III) admitted to the Armed Forces Hospital, Wadi Al-Dawasir, Kingdom of Saudi Arabia, between October 1998 and November 2002 were included in the study. Patients were given a premedicant with an amnesic effect. Anesthetic equipment with a built-in end-tidal anesthetic gas monitor was checked preoperatively. Minimal anesthetic concentrations of vapors were delivered and monitored. Intraoperative analgesia was provided whenever appropriate. Patients were closely observed for signs of intraoperative awareness under general anesthesia. All patients were interviewed within 24 hours postoperatively on the occurrence of awareness and service satisfaction.

Results: There were 4368 patients admitted to the study. Their ages ranged from 14-104 years (mean 40.2 years). All patients were interviewed in the postoperative period. There was no report of awareness during surgery and patient satisfaction score was 100%.

Conclusion: Preoperative and intraoperative anesthetic attention to patients presented for surgery, together with the use of modern anesthetic delivery units possessing facilities for monitoring anesthetic gases, and the provision of good analgesia are the most important combination in eliminating awareness during surgery.

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Despite the relatively small percentage of surgical patients who experience awareness during general anesthesia (GA), this phenomenon ranks among patients'greatest fears regarding surgery.[1,2] Awareness during surgery happens, awareness during anesthesia is oxymoron. The experience of awareness is one of the most psychologically devastating sequel of surgery.[3] The incidence of awareness varies widely between individuals and surgical specialties, and it is as twice in patients who receive a muscle relaxant during surgery than those who do not receive it.[4] It may occur at any time: during induction of anesthesia (tracheal intubation), during maintenance, and during emergence. Awareness is an old problem and efforts towards abolishing or minimizing its incidence are continuing. In spite of these attempts, recent reports show that the incidence of awareness is between 0.11% and 1.5% of individuals who receive GA.[1,4,5] As many as 70% of patients with intraoperative awareness experienced unpleasant aftereffects, including sleep disturbances, dreams and nightmares, flashbacks, and anxiety during the day. A minority of them can develop the post-traumatic stress disorder (PTSD), which is associated with repetitive nightmares, anxiety, irritability and preoccupation with death. These symptoms may persist for months, or even years,[6,7] and require long-term medical and psychological support or treatment.[8] Added to the personal problems arising from the occurrence of awareness are media attention and litigation, which appear to be on the rise.[8] There are

From the Department of Anesthesia & Intensive Care (Messahel) and the Department of Surgery (Al-Qahtani), Armed Forces Hospital, Wadi Al-Dawasir, *Kingdom of Saudi Arabia*.

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Address correspondence and reprint request to: Dr. Farouk M. Messahel, Chief of Anesthesia & Intensive Care, Department of Anesthesia & Intensive Care, Armed Forces Hospital, PO Box 228, Wadi Al-Dawasir 11991, *Kingdom of Saudi Arabia*. Tel. +966 (1) 7842779/53434653. Fax. 966 (1) 7841065 Ext. 4623. E-mail: fmamessahel@doctors.org.uk

more than one cause of awareness: 1. Failure of the anesthetic apparatus to deliver the determined amount of the anesthetic. 2. Inappropriate planning of anesthetic techniques in accordance with the different variables between individuals and also with the surgical procedures. 3. Failure to adequately provide the paralyzed patient with the appropriate concentration to maintain anesthesia either by the inhalational or intravenous (IV) route. 4. The induction dose of the IV agent is unreliable to prevent awareness before the inspired anesthetic gas reaches its minimal anesthetic concentration (MAC), which is the concentration maintaining the patient anesthetized.

There are no reports on the incidence of awareness in Saudi medical literature. We conducted this study as part of the ongoing quality improvement program established in our Hospital in 1997 and boosted very recently by the introduction of the total quality management in the Military Health Service of the Saudi Armed Forces, Kingdom of Saudi Arabia (KSA).

Methods. Approval of the Hospital Research and Ethics Committee, Riyadh, KSA together with the approval of the Quality Management Services Department, Riyadh, KSA was obtained. The study was carried out between October 1998 and November 2002. Patients >14 years old, ASA I-III, presented for different surgical procedures under GA (there are no cardiac or neurosurgery services at our Hospital) were admitted to the study. Our anesthetic delivery units (Datex-Ohmeda AS/3, Finland) have facilities to monitor the end-tidal anesthetic gas concentrations (ETAGC). They also have a built-in checking system including detection of gas leaks, which operates at the start of the surgical list. Moreover, our operating rooms are provided with a portable monitor for the detection of environmental pollution by the anesthetic gas nitrous oxide. The anesthetic management of patients consisted of pre-medicating all elective cases with an anxiolytic (usually a benzodiazepine), except patients >60 years old who were not pre-medicated, and patients for elective cesarean section (CS) who received (as part of their preoperative management) either an H_2-blocker or proton pump inhibitor. Anesthesia was induced with fentanyl, 1-1.5 mcg/kg^{-1} (given in CS after clamping of the umbilical cord), and by thiopental, 3-5 mg/kg^{-1}, and was maintained by nitrous oxide in oxygen to which added an inhalational anesthetic (isoflurane or sevoflurane). The dose of the inhalational anesthetic and the incremental doses of the narcotic analgesic were titrated according to the variation in the response of the cardiovascular system during surgery. Patients were observed for intraoperative signs of awareness: sweating, tachycardia, hypertension, lacrimation and dilatation of pupils. All in-patients were interviewed within 24 hour of surgery or anesthesia, while patients for day-case surgery were visited once they were fit for discharge. Special forms have been designed for this interview. These forms are used for data collection including the occurrence of awareness. The postoperative interview is normally conducted by an anesthetist other than the one who administered the anesthetic. If the patient does not spontaneously mention any recall of the events happened during the procedure, they specifically were asked on it. Questions asked on awareness in this structured interview are:[9] 1. What is the last thing you remember before you went to sleep for your operation? 2. What is the first thing you remember after your operation? 3. Can you remember anything in between these 2 periods? 4. Did you dream during your operation? 5. Are you satisfied with this part of the service?

Results. There was a total of 4368 cases (2069 males and 2299 females with a male to female ratio of 0.9-1) during the study period. The mean age was 40.2 years (range 14-104 years). During the preoperative visit, 2 patients complained of explicit awareness during previous surgical procedures. The first patient was a Saudi female who had a CS at another hospital. The second patient was a North American who remembered the anesthetist back home talking to her when he discovered that she was awake. Both patients received an explanation from us and were assured of meticulous attention during the course of surgery. None of the patients voluntarily complained of awareness before or during the interview, therefore, all patients were specifically asked on awareness and all of them categorically denied its occurrence. In fact, the vast majority of them expressed (with body signs) that they were totally asleep during surgery and they were neither aware nor had dreams during the course of surgery. To this effect, patient satisfaction's score was 100%.

Discussion. In spite of the fact that there is always an unfavorable strong public and media focus on the anesthetic service,[10-14] patient confidence in the anesthetist has been reported to be high.[15] Nevertheless, awareness is still one of the patients' fears of anesthesia.[16] Since awareness during surgery was first brought to the attention of the medical profession,[17] ways of detection and prevention were unabated, and while unintentional awareness still exists,[9,18] its incidence is decreasing. In general, anesthetists rely on vital signs as indicators of potential arousal. Clinical observation remains the mainstay of the diagnosis of impending or actual awareness, which usually heralded by an increase in autonomic (sympathetic) activity, reflected by the following signs: increase in heart rate (HR), rise in blood pressure (BP), dilatation of pupils, sweating, lacrimation, and increase in metabolic rate.[19] However, traditional vital signs monitoring may confirm lack of correlation between HR, BP, and consciousness.[6,20] Numerous studies have documented awareness with stable HR and BP.[6,21-23] Our modern anesthetic delivery units have facilities for monitoring ETAGC, so that the exact amount given to patients is

known. In our study, attention was given to the adequacy of the anesthetic technique and the ETAGC delivered to the patient in different types of surgical procedures. The latter is a recommended approach.[20,24] Out of the many methods of detecting arousal during anesthesia only clinical observations and the bispectral index (BIS) monitor are in current use.[25] Bispectral index (Aspect Medical Systems, Newton, United States of America) was developed as a new electroencephalogram (EEG) based method of monitoring anesthetic depth. The EEG signal is analyzed by bispectral analysis, which consists of Fourier transformation and phase coupling studies.[25,26] The bispectral index, BIS and many other variables are calculated by the BIS-monitor, and it is possible to obtain numerical information on these variables during anesthesia with a very short delay. Bispectral index has been found useful in monitoring anesthetic depth.[27,28] The BIS-monitor can also guide the anesthetist during anesthesia to obtain sufficient anesthesia with reduced amounts of anesthetic (cost saving) and allows a faster recovery from anesthesia.[29,30] Despite the general belief that the use of BIS prevents awareness, it is not even a claim by the manufacturer.[31] Whether such a monitor actually decreases the risk of awareness has yet to be proven.[4,32,33] However, the vast majority of centers do not possess modern anesthetic or monitoring equipment.[34] In addition, these equipment, including the BIS, have limitations and patients may be explicitly aware at monitoring figures known to be adequately hypnotic.[35-40] That is why anesthetists vigilance stands as the most important element in the prevention and detection of awareness during surgery.[23]

Recommendations for avoidance of awareness during surgery include: 1. Prescription of a premedicant with an amnesic property. 2. Checking anesthetic delivery units for possible leaks. 3. Administer a muscle relaxant only when necessary. 4. Delivery of one MAC of volatile anesthetic agent. 5. Monitoring of end-tidal gases and vapors. 6. Provision of adequate intraoperative analgesia. 7. Monitoring of HR, BP, end-tidal carbon dioxide ($ETCO_2$), pupil size, sweating, lacrimation, temperature and neuromuscular junction.

Outcome studies have become increasingly important in managed healthcare and patient satisfaction is considered as one of the most clinically relevant measures of outcome.[41,42] It is a useful measure of quality of care that can contribute to a balanced evaluation of the structure, process and outcome of services. Many believe that patient satisfaction is an attribute of the quality of care in anesthesia.[43-45] By itself, recall of intraoperative events is an indication of failure to anesthetize.[46] That was the reason in our routine postoperative visit to patients, we did not inquire to patient satisfaction in general, but specifically, for the sake of the study, asked patients on the degree of their satisfaction in connection with this part of the services and that achieved full satisfaction.

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