

Original article

AWARENESS DURING ANAESTHESIA IN MAHARAJ NAKORN CHIANG MAI HOSPITAL

Tanyong Pipanmekaporn, M.D., Wariya Sukhupragarn, M.D.,
Panpimol Kongthavonsakul, M.D.

Department of Anesthesiology, Faculty of Medicine, Chiang Mai University

Abstract The incidence of awareness with recall during anaesthesia has been estimated at 0.2-0.3% during general surgery. Although intraoperative awareness occurs infrequently, it has the highest risk factor of patient dissatisfaction after anaesthesia and could largely affect the wellbeing of these patients, especially regarding psychological consequences. We collected data from all the elective cases receiving general anaesthesia at Maharaj Nakorn Chiang Mai Hospital from March 1, 2003 to February 29, 2004. Among 6,170 cases, 7 were (0.11%) of intraoperative recall of awareness. Awareness was found in 4 female and 3 male patients. Patients experiencing awareness reported sound, feeling the operation without pain, pain and paralysis. However no serious psychological problems were reported in these patients. The contributing factors included inadequate knowledge, medication dosage and care from inexperience. The corrective strategies included guideline practice, additional training and improved supervision. **Chiang Mai Med Bull 2006;45(1):19-26.**

Keywords: awareness, intraoperative recall, memory, anaesthesia

The state of general anaesthesia implies a lack of consciousness or awareness. The incidence of awareness with recall during anaesthesia has been estimated at 0.2-0.3% during general surgery.^(1,11,12) In general, awareness during general anaesthesia can be classified as explicit memory which is defined as conscious awareness and implicit memory defined as unconscious awareness.⁽²⁾ During such episodes, information may be stored temporarily into short term and may or may not be

stored into long term memory.⁽¹⁾ A large proportion of patients who were aware during anaesthesia, especially those with explicit memory, developed post traumatic disorder (PTSD).⁽³⁾ This syndrome, which is characterized by anxiety, irritability, insomnia, repetitive nightmares, depression and preoccupation with death, is appropriate for treatment and a follow up should be arranged with a skillful psychiatrist.^(4,6)

Awareness may occur under many circumstances.⁽⁵⁾ There may be fault in equipment, error of techniques, deliberate light anaesthesia, small doses of the principle anaesthetic, and surgical risk such as cardiac surgery, and caesarean section.^(3,6,11) However, most of these situations are preventable. This study aimed to examine these incidents, the contributing factors, treatment and psychological consequences of intraoperative recall of awareness.

Patients and methods

This study was designed as a descriptive study. After obtaining approval from the Institution Ethics Committee, anesthetic records and post anaesthetic visiting records of patients who underwent elective surgery under general anaesthesia at Maharaj Nakorn Chiang Mai Hospital from 1 March 2003 to 29 February 2004 were retrospectively reviewed. Patients excluded from the study were those who had cerebrovascular disease, undergone cardiopulmonary bypass, psychiatric problems or emergency surgery. Details of age, sex, preanaesthetic conditions, anaesthetic management, intraoperative events and perioperative complications within 24 hours were recorded on a standardized form. Details of events included type of anaesthesia management after the incidents and factors promoting and reducing the severity and potential of the incidents.

Risk factors were categorized into patients, anaesthetic and surgical factors. Patient risk factors included unstable hemodynamics, pre-existing psychologized problems and metabolic disturbance. Anaesthetic risk factors included premedication and drug utilization. Surgical risk factors included type and site of surgery. Two reviewers independently reviewed all record forms to identify the contributing factors, and factors that minimize the incidents and correc-

tive strategies. Any controversy was discussed in order to achieve a consensus.

Results

Among 6,170 (3,005 males and 3,165 females) anaesthetized cases, the age range of the patients varied from 16-90 years, with two-thirds falling within 16-60 years. Seven patients reported some degree of awareness. Awareness was found in 4 female and 3 male patients, 5 patients (70%) were between 50-70 years old and all had ASA physical status 1 and 2. Most patients recalled events during the maintenance period. Our study showed that the majority of patients underwent orthopedic (n = 3), gynecological (n = 1), general (n=2), and urological surgery (n=1). Patients experiencing awareness reported sound (57%), feeling the operation without pain (43%), pain (43%), and intubation and paralysis (43%). The clinical course of each patient is summarized as follows (Table 1). There was a slight impact of anesthesia awareness in these patients (42% had mild anxiety) despite a small percentage of proper management by reassurance. There was no incidence associated with awareness of extreme hypertension and/or tachycardia during anaesthesia.

The three common contributing factors included lack of knowledge (57%), inappropriate drug dose (43%), inadequate care or inexperience (28%), but some of these causes could have been preventable (71%) and partially preventable (29%). Factors minimizing incidents included high alertness of anesthetic personnel to intraoperative awareness, regular checking of the anaesthetic delivery and vaporizer, and improving the training course. The suggested corrective strategies include guideline practice (71%), improved supervision (57%), quality assurance activity (43%) and

Table 1. Awareness cases and details from the anaesthetic records (n=7)

Patient No.	Patient Details	Operation	Pre-medication	Anaesthesia	Perception during intraoperative awareness	Postoperative psychic traumas	Contributing Factors	Corrective Strategies
1	Female 67 yr 39 kg ASA II	Rt. Salpingo Oophorectomy and Peritoneal wall biopsy Duration time 160 min	No	Thiopental 200 mg Rocuronium 50 mg+ Pancuronium 1.5 mg Fentanyl 60 ug 50% N2O in O2 Halothane 0.5-1%	- Heard sound and noise - Felt intubation - Pain and paralysis	None	- inadequate medication dosage	- Guideline practice
2	Female 54 yr 65 kg ASA I	Right Mastectomy Duration time 120 min	Diazepam 5 mg 2 hours before operation	Thiopental 400 mg Pancuronium 6 mg Fentanyl 90 ug 70% N2O in O2 Halothane 0.7% +Isoflurane 0.5-1%	- Felt skin incision - Mild pain	None	- Inadequate care from inexperienced	- Guideline practice - Quality assurance activity
3	Male 21 yr 60 kg ASA I	Close reduction and Internal fixation left humerus Duration time 105 min	Diazepam 10 mg 3 hours before operation	Propofol 100 mg Pancuronium 4 mg Fentanyl 130 ug 70% N2O in O2 Halothane 0.5%	- Heard noise and music during surgery - No pain and paralysis	- Temporary emotional stress and anxiety	- Inadequate knowledge	- Improved supervision - Additional training
4	Male 70 yr 57 kg ASA II (Hypertension)	Decompressive Laminectomy with Posterior fusion Duration time 120 min	Diazepam 5 mg 4 hours before operation	Thiopental 300 mg Vecuronium 8 mg Fentanyl 100 ug 70% N2O in O2 Isoflurane 0.2-1%	- Felt pain at skin incision - Heard voice	- Mild anxiety	- Inadequate knowledge - Inadequate medication dosage	- Guideline practice - Improved supervision

Patient No.	Patient Details	Operation	Pre-medication	Anaesthesia	Perception during intraoperative awareness	Postoperative psychie trauma	Contributing Factors	Corrective Strategies
5	Female 54 yr 65 kg ASA I	Decompressive Laminectomy with Posterior fusion with instrumentation Duration time 105 min	Ativan 0.5 mg 2 hours before operation	Propofol 100 mg Vecuronium 8 mg Fentanyl 80 ug 70% N2O in O2 Isoflurane 0.2-0.6% +Halothane 0.2%	- Felt endotracheal intubation - Felt paralysis	None	- Inadequate knowledge - Inadequate medication dosage	- Guideline practice - Improved supervision
6	Male 39 yr 57 kg ASA II (pneumoni a.anemia)	Scalp flap with radial forearm flap Duration time 9 hr 35 min	Diazepam 10 mg 2 hours before operation	Propofol 130 mg Pancuronium 17 mg Fentanyl 150 ug 70% N2O in O2 Isoflurane 0.5-1% 9 hr 35 min	- Felt endotracheal tube in throat - Could not breath	- Anxiety - Fear of anaesthesia	- Inadequate medication dosage - Inadequate care from inexperienced	- Guideline practice - Additional training
7	Female 70 yr 53 kg ASA II	Right Percutaneous Nephrolithotomy Duration time 110 min	Diazepam 5 mg hours before operation	Propofol 100 mg Atracurium 30 mg Fentanyl 50 ug 70% N2O in O2 Isoflurane 1%	- Heard sound during the operation - No pain	None	- Inadequate knowledge	-Quality assurance activity

additional training (28%).

Discussion

The majority of awareness during anaesthesia cases is not only a problem of specific surgical procedures, There are also occasional occurrences during anaesthesia in almost all elective procedures. Most patients who were aware recalled events during the maintenance period such as sound, pain, paralysis, intubation and feeling surgery without pain. Previous studies found that this adverse effect should be of great concern because patients may be permanently disabled by the experience of being awake during surgery. Its consequences are pain, hearing sound and voices, daytime anxiety, sleep disturbance, nightmares and possibly great affect in the wellbeing of these patients.^(4,6) There was no serious consequence reported in our study, whereas, three of seven patients with awareness (42%) had temporary emotional stress and mild anxiety, and they received management by reassurance. However, they also needed a long term follow up and appropriate treatment.

This study could not identify the actual risk factor associated with intraoperative awareness because it had inadequate information and fewer incidents. However, the database of Thai Anesthesia Incidents Study (THAI Study) demonstrated that anaesthesia was the sole contribution factor in 80% of cases and a combination with other factors in 10%.⁽⁷⁾ Factors contributing to anaesthetic risk included the routine use of neuromuscular blocking agents, low concentration of inhalation, premature lightening of anaesthesia at the end of surgery, and insufficient anaesthesia as a result of technical error or equipment failure, which correlated with previous reports.^(7,11) For patient related factors, the incidence of intraoperative

recall of awareness was reported as greater in hemodynamic unstable patients, in whom drugs as an amnesic property should be carefully titrated to prevent awareness.⁽⁷⁾ Patient characteristics known to increase anaesthetic requirement such as chronic alcohol consumption and drug abuse should be considered for the choice and dosage of anaesthetic agents.⁽²⁾ It was quite difficult to provide the balance between anaesthetic requirement and delivery, especially in elderly patients who may be concerned about fatal consequences, and a hemodynamic effect of the anaesthetic agents was mostly applied in our patients.⁽¹⁾ The surgical related factors were identified as cardiac, obstetric and major trauma surgery.^(2,6,7) Although we excluded patients in the high risk group for awareness, we surprisingly still demonstrated a recall of awareness in the general surgical population in the low risk group. The possible cause of awareness in our cases was the anaesthetic technique, which probably tends to be maintained at a lighter level as routine care. From details in our database, benzodiazepam was administered as premedication (72%). Intravenous drugs including Thiopental, Propofol or Etomidate were mostly used as the choice of induction. During the intraoperative period, anaesthesia was maintained by neuromuscular blocking agents (89%), opioids (100%) inhalation anaesthetic agents (95%) and N₂O in oxygen (44%). Classification by type of operation was dental surgery (0.1%), ear nose and throat surgery (16.2%), general surgery (36%), obstetric and gynecologic surgery (13.6%), orthopedic surgery (17.7%) and urologic surgery (10.7%). Anaesthetists vary their procedure to reduce anaesthetic drug concentration towards the end of surgery, and we found that some of them discontinued inhalation agents and N₂O a long time before

wound dressing was completed. Additionally, our center is a university hospital and several personnel were anaesthetic residents who had had inadequate knowledge, care or inexperience during anaesthesia procedures.

Better knowledge could have potentiated preventable adverse anaesthetic outcome in our study. The proposed recommendations for the prevention of awareness include preoperative assurance given to patients the day before surgery to relieve patient anxiety; consideration of amnestic drugs at premedication or during anaesthesia and minimal use of neuromuscular blocking agents; concern regarding discontinuation of anaesthetic drug administration on completion of wound closure;⁽¹¹⁾ administration in conducting periodic maintenance of the anaesthetic delivery machine and its vaporizers; and regular checking of the machines and ventilator before and during anaesthesia.^(2,6) A steady increase in the understanding of the phenomenon and perception of importance in awareness should also apply on the part of the patient in addition to anaesthetists and surgeons.⁽³⁾ The suggested corrective strategies should also include guideline practice, improved supervision and additional training, thereby contributing to quality assurance activity by setting a standard in the practice of anaesthesia.⁽⁷⁾ As clinical monitoring of arterial pressure, heart rate, sweating and tear production was of little benefit in predicting the conscious state of patients during surgery, it cannot be used to determine reliably the occurrence of intraoperative awareness.^(6,9) The observation of movement responses is the best clinical measurement for detecting impending awareness during surgery.⁽²⁾ The end tidal gas concentration of inhaled anaesthetic should be monitored,⁽²⁾ and a reliable monitor of cerebral function and depth

of anaesthesia has led to the clinical introduction of the bispectral index scale (BIS),^(7,10,11) which is an electroencephalogram - based monitoring tool that indicates a real time measure of hypnotic levels and improves the overall effectiveness of anaesthetic delivery and surgical experience.⁽¹¹⁾ The use of BIS monitoring during general anaesthesia, requiring endotracheal intubation and/or muscle relaxants, reduces incidence of awareness and facilitates anaesthetic titration.^(11,12) BIS values between 40 and 60 are recommended from the commencement of laryngoscopy to the time of eye opening. Consequently, it is reasonable to use BIS guided anaesthesia as routine monitoring in high risk patients of awareness, whereas general surgical populations may not receive much advantage from this form of monitoring. Therefore, we need additional data to support the use of BIS guided anaesthesia for these populations. The limitations of this study included some inaccuracies and incomplete data notation on the record form, and low and variable interview rates, especially in the early period of the study.

Summary

This study found awareness in seven patients. Most of our patients were in the low risk group. There are many factors related to awareness including anaesthetics, patients and surgical related factors. Preventing and controlling anaesthetic depth with reliable tools during anaesthesia, and setting up guideline practice and quality assurance activity may be associated with a lower frequency of awareness.

Appendix

Patient interview

Each patient was interviewed by assigned residents or anaesthetist nurses in the wards

between the first 24 and 36 hours. These interviewers had not been presented in the theatre during the operations. The same routine was used for each interviewer. After a brief explanation of the purpose of the interview, the interviewers commenced by asking three simple questions.

1. What was the last event you remembered before going to sleep?

2. What is the first event you remember on awakening?

3. Did you dream or have any other experiences while you were asleep?

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ภาวะการรู้สึกตัวในผู้ป่วยที่ได้รับยาระงับความรู้สึก ของโรงพยาบาลมหาราชนครเชียงใหม่

ต้นหยง พิพานเมฆาภรณ์, พ.บ., วรียา สุขุประการ, พ.บ., พรรณพิมล คงถาวรสกุล, พ.บ.

ภาควิชาวิสัญญีวิทยา คณะแพทยศาสตร์เชียงใหม่ มหาวิทยาลัยเชียงใหม่

บทคัดย่อ ภาวะรู้ตัวและการจำเหตุการณ์ระหว่างผ่าตัดได้ซึ่งถือว่าเป็นภาวะแทรกซ้อนทางวิสัญญีที่พบได้ประมาณร้อยละ 0.2-0.3 ของการผ่าตัดทั่วไป ถึงแม้ว่าภาวะนี้จะพบได้ไม่บ่อยแต่อาจมีผลกระทบต่อผู้ป่วยอย่างมากโดยเฉพาะผลต่อสภาพจิตใจ การศึกษาครั้งนี้เป็นการศึกษาเชิงพรรณนาเพื่อวิเคราะห์ ภาวะรู้ตัวและจำเหตุการณ์ขณะผ่าตัด ปัจจัยส่งเสริมการรักษาตลอดจนผลกระทบต่อจิตใจของผู้ป่วยโดยทำการศึกษาในผู้ป่วยซึ่งนัดมาทำผ่าตัดและได้รับยาระงับความรู้สึกแบบทั่วไปที่โรงพยาบาลมหาราชนครเชียงใหม่ ระหว่าง 1 มีนาคม พ.ศ. 2546 ถึง 29 กุมภาพันธ์ พ.ศ. 2547 ซึ่งมีจำนวนทั้งสิ้น 6,170 ราย พบผู้ป่วยที่มีภาวะรู้ตัวและจำเหตุการณ์ระหว่างการผ่าตัดจำนวน 7 ราย (ร้อยละ 0.11) โดยพบใน ผู้ป่วยหญิง 4 รายและ ชาย 3 ราย ผู้ป่วยจำนวน 5 รายมีอายุระหว่าง 50-70 ปี และผู้ป่วยดังกล่าวมี ASA physical status 1 และ 2 ผู้ป่วยรายงานเหตุการณ์ว่าได้ยินเสียง รู้สึกว่าถูกผ่าตัดแต่ไม่เจ็บ รู้สึกเจ็บ และไม่สามารถขยับเขยื้อนได้ระหว่างการผ่าตัด โดยภาวะดังกล่าวไม่ได้มีผลกระทบต่อสภาวะทางจิตใจของผู้ป่วยปัจจัยที่อาจเกี่ยวข้องกับการเกิดภาวะแทรกซ้อนดังกล่าวได้แก่ การมีความรู้ที่ไม่เพียงพอ การให้ยาในปริมาณที่ไม่เหมาะสม และขาดประสบการณ์ และมาตรการที่สามารถช่วยลดอุบัติการณ์ดังกล่าวได้แก่ การจัดทำแนวทางปฏิบัติสำหรับการให้ยาระงับความรู้สึก การฝึกอบรมเพิ่มเติม และการจัดให้มีผู้เชี่ยวชาญคอยแนะนำ **เชียงใหม่เวชสาร 2549;45(1):19-26.**

คำสำคัญ: ภาวะรู้ตัว การจำเหตุการณ์ระหว่างการผ่าตัด ความจำ การระงับความรู้สึก