An Analysis of Intraoperative Recall of Awareness in Thai Anesthesia Incidents Study (THAI Study)

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Objectives : *This study aimed to analyze intraoperative awareness using database of Thai Anesthesia Incidents Study (THAI Study) with regard to frequency, contributing factors, preventive and corrective strategies.*
Material and Method : *Details of intraoperative recall of awareness were recorded prospectively by attending anesthesiologists or nurse anesthetists in standardized record forms during February 1,2003 to July 31, 2004. Participating hospitals included 7 university hospitals, 5 tertiary care hospitals, 4 secondary care hospitals, and 4 primary care hospitals. All data were analyzed to identify contributing factors, preventive and corrective strategies.*
Results : *Among 126078 general anesthetized cases, there were 99 cases of intraoperative recall of awareness. Awareness was found in female patients more than male patients (63% versus 37%). The majority of patients had ASA PS 1 and 2. Cardiac, obstetric, and lower abdominal surgery were involved in anesthesia awareness more than other type of surgery. Patients experiencing awareness reported sound (62%), pain (51%), feeling operated without pain (33%), and paralysis (25%). There was slight impact of anesthesia awareness in Thai patients (only 13% had temporary emotional stress and 13% had mild anxiety) despite small percentage of proper management by reassurance and psychiatric consultation (15%). The contributing factors included inadequate knowledge (67%), inadequate medication dosage (44%), and inadequate care from inexperience (11%). Awareness incidents were documented to be preventable in 36% of patients and partially preventable in 38 % of patients. The corrective strategies included guideline practice (30%), additional training (28%), quality assurance activity (19%), and improved supervision (16%).*
Conclusion : *The incidence of intraoperative recall of awareness in this study was 0.08%. Patients reported sound, pain, feeling operated without pain, and paralysis. Corrective strategies included guideline practice, additional training, quality assurance activity, and improved supervision.*

Keywords : *Anesthesia, Intraoperative, Recall, Awareness*

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The reported incidence of intraoperative recall of awareness varied from 0.1 % to 1.5%[1-7]. Patients experiencing awareness reported auditory recollections, sensations of not being able to breathe, and pain. [7] Although intraoperative recall of awareness occurred infrequently, it was the highest risk factor for patient dissatisfaction after anesthesia [8] and might greatly affect well-being of these patients. Some patients could have life-long adverse psychological consequences, including symptoms associated with post-traumatic stress disorder[8-10]. In Thailand, there are variations of anesthetic personnel, monitoring equipment and clinical guidelines for anesthetic management. The incidence and impact of intraoperative recall of awareness have not been widely investigated.

This study was aimed to analyze intraoperative recall of awareness using database of Thai Anesthesia Incidents Study (THAI Study) with regard to

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outcomes, contributing factors, appropriateness of event management, and corrective strategies

Material and Method

The Thai Anesthesia Incidents Study (THAI Study) is a multi-center study comprising 20 hospitals: 7 university, 5 tertiary, 4 secondary and 4 primary care hospitals. The incidence of adverse events was monitored between February 1, 2003 and July 31, 2004. The THAI Study was reviewed and approved by the Institutional Ethics Review Board at each of the involved institutions. Details of age, sex, preanesthetic conditions, anesthetic management, intraoperative events and perioperative complications within 24 hours, on consecutive patients, were recorded on a standardized form.

Intraoperative recall of awareness is defined as unexpected, undesirable patient wakefulness during general anesthesia and the subsequent conscious recollection of events, feelings, or sensations specific to that period.[11]The details of awareness were recorded by the attending anesthesiologists or nurse anesthetist and verified by the site manager. Three peer reviewers reviewed the recorded form to identify clinical risk factors, contributing factors and corrective strategies. Any controversy was discussed to achieve a consensus.

Each incident form was reviewed and relevant factors entered into a Microsoft Excel spread sheet. Data were entered as originally recorded on the individual reports. Then the data were analyzed. Demographic data included age, sex, ASA status and co-

Table 1. Patient characteristics

		Awareness (N=99)	%
Sex			
	Male	37	37.37
	Female	62	62.63
Age			
	<12 years old	0	0.00
	12-65 years old	89	89.90
	>65 years old	10	10.10
	Range (years)	18-81	
	Mean (SD)	41.26(15.7)	
ASA PS			
	1	32	32.32
	2	52	52.53
	3	14	14.14
	Not stated	1	1.01

Table 2. Detail of awareness

Period of time	Awareness (N=99)	%
Induction & intubation	5	5.05
Maintenance	84	84.85
Emergence	17	17.17
Remembrance	Awareness (N=99)	%
Sound	61	61.62
Pain	50	50.50
Feeling operate without pain	33	33.33
Paralysis	25	25.25
Intubation	6	6.06
Panic	3	3.03

morbidities. Details of events included type of anesthesia used, management after the incident and factors promoting and reducing the severity of the incident and its potential.

Risk factors were categorized into patient, anesthetic, surgical and systematic factors. Patient risk factors included unstable hemodynamic, preexisting psychological problem and metabolic disturbance. Anesthetic risk factors included premedication and drugs utilized. Surgical risk factors included type of surgery and site of surgery. Systematic risk factors included the level of hospital. Because data were qualitative, descriptive statistics were performed.

Results

Among 20 hospitals in Thailand from February 2003 to July 2004, a total of 126,078 general anesthetics were enrolled. Demographic data of the ninety-nine awareness incidents reported are shown in Table 1. Intraoperative recall of awareness was found in female patients more than male patients (63% versus 37%). The majority of patients had ASA PS 1 and 2.

Most patients (85%) recalled events during maintenance period. Within 24 hours following the events, patients experiencing awareness reported sound (62%), pain (51%), feeling operated without pain (33%), and paralysis (25%)(Table 2). For the outcome of awareness, 68% of patients did not have any consequence. Twenty-eight percent of patients reported at least one symptom included temporary emotional stress (13%), anxiety (13%), and sleep disturbance (3%) (Table 3).

The incidents occurred most frequently in university hospitals (70% from university hospital, 26% from tertiary care hospital and 4% from secondary care hospital). Anesthesia was considered to be the sole contribution factor in 80% of patients and a combination with other factors in 10% of patients. According to risk factors related to anesthesia, patients experiencing awareness were premedicated in only 38% of patients. Agents used intraoperatively included benzodiazepines (47%), neuromuscular blockers (96%), inhalation anesthetics (96%) and opioids (100%)(Table 4). There was no incidence of hypertension and/or tachy-

Table 3. Outcome of awareness

	Awareness (N=99)	%
No symptom	67	67.68
At least 1 symptom	28	28.28
Temporary emotional stress	13	13.13
Anxiety	13	13.13
Sleep disturbance	3	3.03
Dream	0	0
Post traumatic stress	0	0
Flashbacks	0	0
Not stated	4	4.04

Table 4. Anesthetic factors

	Awareness (N=99)	%
Premedication	38	38.38
Agents used intraoperatively		
IV anesthetics	92	92.93
Benzodiazepine	47	47.47
Depo-neuromuscular blockade	29	29.29
Nondepo-neuromuscular blockade	95	95.96
Nitrous oxide	73	73.74
Inhalation anesthetics	95	95.96
Opioids	99	100.00
Local anesthetics	9	9.09

Table 5. Surgical factors

Type of surgery	Awareness (N=99)	%
Elective	61	61.62
Emergency	38	38.38
Site of surgery	Awareness (N=99)	%
Cardiac	22	22.22
Lower abdominal including kidney/ureter	19	19.19
C-section	14	14.14
Extremities	9	9.09
Upper intraabdominal	8	8.08
Lumbosacral spine	7	7.07
Intrathoracic	3	3.03
Maxillo-facial	3	3.03
Micro DL	3	3.03
Breast	2	2.02
Perineal-anal	2	2.02
Intracranial	1	1.01
Thoracic spine	1	1.01
Other	5	5.05

Table 6. Contributing factors

	Awareness (N=99)	%
Human failure		
Presence	0	0.00
Knowledge	66	66.67
Inadequate care	11	11.11
Inadequate communication	4	4.04
Lack of supervision	3	3.03
Equipment failure		
Presence	1	1.01
Function	1	1.01
Medication failure		
Type	1	1.01
Route	0	0.00
Dosage	44	44.44
Time	3	3.03
Organizational factor	3	3.03
Unknown	10	10.10

cardia during anesthesia associated with awareness. Patient-related factors included unstable hemodynamic (30%), and preexisting psychological problem (1%). As for surgical factors, 62% of patients involved in elective surgery and 38% of patients involved in emergency surgery. The majority of patients underwent cardiac (22%), obstetric (14%), and lower abdominal surgery (19%)(Table 5). Considering systems analysis, the three most important contributing factors included: inadequate knowledge (67%), inadequate medication dosage (44%), and inadequate care from inexperience (11%)(Table 6).

Event management was evaluated. Nineteen percent of patients were adequately treated, 71% of patients were inadequately treated but not hazardously whereas 8% of patients received inadequate and hazardous treatment. Awareness incidents were documented to be preventable in 36% of patients and par-

Table 7. Event management, preventability, and corrective strategies

Adequacy of event management	Awareness(N=99)	%
Inadequate and hazardous	8	8.08
Inadequate but not hazardous	70	70.71
Not perfect	10	10.10
Perfect	9	9.09
Preventability	Awareness(N=99)	%
Preventable	36	36.36
Partially preventable	38	38.38
Unpreventable	24	24.24
Corrective strategies	Awareness(N=99)	%
Suggest corrective strategy	76	76.77
More manpower	3	3.03
Additional training	28	28.28
Quality assurance activity	19	19.19
Improved communication	2	2.02
Improved supervision	16	16.16
More equipment provided	1	1.01
Equipment maintenance	3	3.03
Guideline practice	30	30.30
Other	11	11.11

tially preventable in 38 % of patients. The majority of reports with proposed corrective strategies included guideline practice (30%), additional training (28%), quality assurance activity (19%), and improved supervision (16%)(Table 7).

Discussion

The incidence of intraoperative recall of awareness in this study was approximately 0.08%, which was comparable to the incidence of previous studies [1-7].

Most patients recalled events during maintenance period as sound, pain, paralysis, and feeling operated without pain. For the outcome of awareness, there was slight impact in Thai patients. The majority of patients did not have any consequence whereas minority had temporary emotional stress, mild anxiety and sleep disturbance. This finding was different from the previous studies [8-10] which found that for those patients experiencing awareness could have life-long psychological consequences, such as sleep disturbances, flashbacks, nightmares, anxiety, and sometimes even a preoccupation with death. The different finding could be from Thai belief and cultural background.

The contribution factors for intraoperative recall of awareness in this study included patient-related factors (unstable hemodynamic), surgical factors (cardiac, obstetric, and lower abdominal surgery) and anesthetic factors (non-premedicated, intraoperative used of neuromuscular blockers). This finding was also consistent with previous reports [7,12]. The incidence of intraoperative recall of awareness was reported to be greater in hemodynamically unstable patients, in which smaller dose of anesthetics must be carefully titrated to decrease significant side effects. Surgical procedures were identified as cardiac, obstetric and major trauma cases. Factors contributing to anesthetic risk reported previously included the routine use of neuromuscular blockers, the increasing use of intravenous anesthesia, as opposed to inhalation, and the premature lightening of anesthesia at the end of surgery.

In our study, awareness was potentially preventable adverse anesthetic outcome. The specific recommendations for the prevention of awareness included considering premedication with amnesic drugs, administering more dose of induction agents if they will be followed immediately by tracheal intubation, avoiding muscle paralysis unless necessary, conduct-

ing periodic maintenance of the anesthesia machine and its vaporizers, and checking the machine and its ventilator before administering anesthesia. [12] The corrective strategies included guideline practice, additional training, quality assurance activity, and improved supervision. Because awareness is difficult to recognize while it is occurring despite the usual clinical monitoring of anesthetic depth, a monitor of cerebral function and depth of anesthesia such as the Bispectral Index Scale (BIS) may be theoretically useful. [13-15] The limitations of this study included some inaccuracy and incompleteness of data notation on record forms despite the extensive introduction phase and emphasis on completeness of the forms throughout the study period.

In summary, the incidence of intraoperative recall of awareness in this study was approximately 0.08%. Anesthesia personnel should balance the psychological risks of intraoperative awareness against the physiological risks of excessive anesthesia during conduct of anesthesia for critical patients.

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การวิเคราะห์ภาวะรู้ตัวและจำเหตุการณ์ระหว่างผ่าตัดได้ในการศึกษาอุบัติการณ์เกิดภาวะแทรกซ้อน ทางวิสัญญีในประเทศไทย

มะลิ รุ่งเรืองวานิช, วรินี เล็กประเสริฐ, โฉมชบา สิรินันทน์, ธนู หินทอง

วัตถุประสงค์: *เพื่อศึกษาอุบัติการณ์ และวิเคราะห์ปัจจัยเชิงระบบที่เกี่ยวข้องกับการเกิดภาวะการรู้ตัว และจำเหตุการณ์ระหว่างผ่าตัด และได้ยาระงับความรู้สึกแบบทั่วไป โดยใช้ฐานข้อมูลจากการศึกษาอุบัติการณ์ เกิดภาวะแทรกซ้อนทางวิสัญญีในประเทศไทย*

วัสดุและวิธีการ: *ศึกษาแบบพรรณนาในผู้ป่วยที่มีภาวะการรู้ตัวและจำเหตุการณ์ระหว่างผ่าตัด ซึ่งได้รับยาระงับความรู้สึกแบบทั่วไประหว่าง 1 กุมภาพันธ์ พ.ศ. 2546 ถึง 31 กรกฎาคม พ.ศ. 2548 ในโรงพยาบาลมหาวิทยาลัย 7 แห่ง โรงพยาบาลตติยภูมิ 5 แห่ง โรงพยาบาลทั่วไป 4 แห่ง และโรงพยาบาลชุมชน 4 แห่ง โดยวิเคราะห์เพื่อหาปัจจัยที่เกี่ยวข้อง มาตรการป้องกันและแก้ไขภาวะแทรกซ้อนดังกล่าว เพื่อนำไปสู่การปรับปรุงระบบ*

ผลการศึกษา: *ในผู้ป่วยที่ได้รับยาระงับความรู้สึกแบบทั่วไปทั้งสิ้น 126,078 ราย พบผู้ป่วยที่มีภาวะการรู้ตัว และจำเหตุการณ์ระหว่างผ่าตัดจำนวน 99 ราย โดยพบในผู้ป่วยหญิงมากกว่าผู้ป่วยชาย (63% และ 37%) ผู้ป่วยส่วนใหญ่อยู่ใน ASA physical status 1 และ 2 ในผู้ป่วยที่รับการผ่าตัดหัวใจ การผ่าตัดคลอด และการผ่าตัดช่องท้องส่วนล่าง พบภาวะรู้ตัวและจำเหตุการณ์มากกว่าการผ่าตัดชนิดอื่น ผู้ป่วยรายงาน เหตุการณ์ว่าได้ยินเสียง (ร้อยละ 62%) รู้สึกเจ็บ (ร้อยละ 51) รู้สึกว่ากำลังถูกผ่าตัดโดยไม่เจ็บ (ร้อยละ 33) และไม่สามารถขยับเขยื้อนได้ขณะผ่าตัด (ร้อยละ 25) ภาวะรู้ตัวและจำเหตุการณ์ระหว่างผ่าตัด มีผลกระทบต่อผู้ป่วยบ้างไม่มาก เช่น ภาวะเครียดทางอารมณ์ (ร้อยละ 13) และวิตกกังวล (ร้อยละ 13) แม้จะได้รับคำแนะนำ และปรึกษาทางจิตเวชเพียงร้อยละ 15 ปัจจัยที่เกี่ยวข้องกับการเกิดภาวะแทรกซ้อนนี้ ได้แก่ ความรู้ไม่เพียงพอ (ร้อยละ 67) การให้ขนาดยาไม่เหมาะสม (ร้อยละ 44) และขาดประสบการณ์ (ร้อยละ 11) ภาวะดังกล่าวสามารถป้องกันได้ถึงร้อยละ 36 และป้องกันได้บางส่วนถึงร้อยละ 38 มาตรการเพื่อลดอุบัติการณ์ดังกล่าวได้แก่ การจัดทำแนวทางปฏิบัติสำหรับการให้ยาระงับความรู้สึก การฝึกอบรมเพิ่มเติม การจัดให้มีระบบประกันคุณภาพงานบริการ และจัดให้มีผู้เชี่ยวชาญคอยให้คำแนะนำ*

สรุป: *อุบัติการณ์ของภาวะการรู้ตัวและจำเหตุการณ์ระหว่างผ่าตัดในการศึกษานี้เท่ากับร้อยละ 0.09 ผู้ป่วยรายงานเหตุการณ์ว่าได้ยินเสียง รู้สึกเจ็บ รู้สึกกำลังถูกผ่าตัดโดยไม่เจ็บ และไม่สามารถขยับเขยื้อนได้ขณะผ่าตัด มาตรการเพื่อลดอุบัติการณ์ดังกล่าว ได้แก่ การจัดทำแนวทางปฏิบัติสำหรับการให้ยาระงับความรู้สึก การฝึกอบรมเพิ่มเติม การจัดให้มีระบบประกันคุณภาพงานบริการ และจัดให้มีผู้เชี่ยวชาญคอยให้คำแนะนำ*