



Original Research Article

Evaluation of current anaesthesia practice by assessing awareness during anaesthesia: A prospective observational study at a tertiary care teaching hospital

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ABSTRACT

Introduction: Intraoperative awareness is an uncommon but extremely unfavourable occurrence affecting patients who undergo surgery under general anaesthesia. The temporary effects of awareness in some patients may be sleep disturbances, nightmares and anxiety. At times, the patients may remain fearful regarding the occurrence of awareness under anaesthesia if in future they require it. The long term effects may range from post-traumatic stress disorder to a preoccupation with death.

Objective: The objective of this study was to evaluate the occurrence of intra-operative awareness in the patients with our current anaesthesia technique.

Materials and Methods: 1000 participants were included in this observational study, who were posted for elective or emergency surgeries or procedures under general anaesthesia. Incidence of intra-operative awareness was assessed by Brice's Questionnaire, modified and translated according to our study design. Patients' interview reports were classified as (a) definite awareness (b) possible awareness (c) no awareness and (d) dreaming.

Results: Out of 1000 participants, 575 (57.5%) were males and 425 (42.5%) were females. In the present study, 780 (78.0%) had elective surgery while 220 (22.0%) had emergency surgery. No intra-operative complications were seen in 844 (84.4%) patients while hypotension was seen in 77 (7.7%) patients, bleeding was seen in 47 (4.7%) and hypoxia was seen in 25 (2.5%) patients. 997 (99.7%) patients didn't have any form of awareness during anaesthesia while two (0.2%) patients had dreaming during anaesthesia and one patient confirmed hearing voices during surgery which was considered as possible awareness according to the definition.

Conclusion: In our study, incidence of possible awareness was found to be 0.1%. Anaesthesia experience was satisfactory among 93.7% patients. Perioperative empathetic approach towards the patients reduces the anxiety, speculations regarding surgery and anaesthesia, and this helps in minimizing the incidence of awareness during anaesthesia.

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1. Introduction

According to the definition of Balanced Anaesthesia given by Lundy in 1926, the basic elements of balanced anaesthesia are unconsciousness, amnesia, analgesia, muscle relaxation, abolition of autonomic reflexes with maintenance of homeostasis. Awareness is explicit recall of intra operative events during general anaesthesia. Awareness

with or without pain under anaesthesia is the most dreaded outcome of anaesthesia practice and it is a nightmare for anaesthesia practitioner. Awareness during general anaesthesia is an important cause of worry for the patients undergoing general anaesthesia.¹ Awareness under anaesthesia is also an important medico-legal complication which every anaesthesia practitioner wishes to avoid. It is very important that we as an anaesthesiologists, pay attention to patient's complains about unintentional awareness and offer psychological support promptly to prevent

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any future psychological consequences.² Administering adequate anaesthesia to prevent awareness, pain and recall is the main role of an anaesthesiologist. This can be achieved by a balanced administration of hypnotic, amnesic and analgesic drugs.³ Unintentional awareness is infrequent, taking place in 1 to 2 patients per 1000 surgeries under general anaesthesia. The extent and severity of unintended awareness varies.^{4,5} Patients may become aware for a short-term or prolonged period of time during general anaesthesia. Remembrance of the events or noises heard during general anaesthesia may arise immediately after surgery or may be delayed for months.⁶ Patients may develop anxiety disorders of variable severity including anxiety, depression, flashbacks, panic attacks, post-traumatic stress disorder and nightmares, which may continue for long-term and need psychological treatment.^{7,8} Patients who receive monitored anaesthesia care or sedation may also complain of unintentional awareness during the process. Hence, it is imperative to prevent the occurrence of awareness during monitored anaesthesia care using anxiolytics and analgesics. Patients who consider they had awareness during general anaesthesia are encouraged to reveal and discuss their experience with the anaesthetists as soon as they suspect its occurrence, so as to avoid future psychological disturbances. We undertook this study to evaluate and document the occurrence of awareness in the patients undergoing surgeries requiring general anaesthesia with our current anaesthesia practice. This study can also help for protocol development for preventing and managing awareness during anaesthesia, if it arises, in medical, medico-legal and psychological terms.

2. Materials and Methods

After obtaining approval from the institutional ethics committee, we conducted this prospective observational study. For this study, data was collected from all the patients who were posted for elective or emergency surgeries or procedures under general anaesthesia at Shree Krishna Hospital, Karamsad. 1000 patients were included in the study. These surgeries and procedures included various general surgeries, laparoscopic surgeries, obstetrics and gynecological procedures, oncosurgeries, neurological, cardiac, ENT, orthopedics, urological, ophthalmic surgeries and endoscopies which required general anaesthesia.

This study included all patients more than 18 years of age undergoing surgery under general anaesthesia, who were able to give informed consent for interview. Patients who refused to give consent for interview, having altered sensorium, ongoing psychological treatment, language barrier or patients not extubated post-operatively were excluded from the study.

For this study, there was no change in routine clinical practice. The choice of anaesthesia for a given surgery or procedure depended on the respective anaesthesia consul-

tant's experience, patient's general condition and type of surgery or procedure. Anaesthetic agents were administered accordingly with or without regional anaesthesia. In all the patients, vital parameters like heart rate, pulse oximetry, non-invasive blood pressure, electrocardiogram, end-tidal CO₂ and adequacy of muscle relaxation with peripheral nerve stimulator were monitored. Apart from these, end-tidal inhalational agent concentration was monitored where available.

Incidence of intra-operative awareness was assessed by Brice's Questionnaire⁹ modified and translated according to our study design. Patients were interviewed in the first 24 hours post-operatively when they were conscious, co-operative and oriented to time, place and person and gave their informed consent for participation in the interview. Interview was conducted by anaesthesia consultant.

Patient's interview reports were classified as (a) definite awareness (b) possible awareness (c) no awareness and (d) dreaming. A recalled event occurring during surgery or anaesthesia that was confirmed by the attending person present in the operating room was considered as definite awareness. A situation in which patient was unable to remember any particular event during anaesthesia/surgery, yet memories could have been associated with the surgical procedure was defined as possible awareness. A lack of recalled intra-operative events with probable memories of situations associated with immediate pre or post-operative period was classified as no awareness. Incidence of dreaming was also assessed and it would be classified as a separate event other than awareness. These definitions were adopted on the basis of a previous study.¹⁰ It was planned that if some patients who were suspected to be having awareness intra-operatively as per interview, would be re-interviewed by another anaesthesia consultant to confirm the possibility of awareness. If awareness was detected and confirmed, the affected patients would receive in-hospital psychological counseling. Other data like ASA status, any personal habits, type of surgery and nature of surgery (elective or emergency), difficulty of intubation, medications given for anaesthesia via intravenous or inhalational routes, occurrence of intra operative complications like bleeding, hypotension, arrhythmia or hypoxia were recorded. The results were analyzed by descriptive analysis and their association with awareness under anaesthesia was also studied using chi-square test and Fisher's exact test.

3. Results

In the present study, 1000 patients were included. Out of them, 575 (57.5%) were males and 425 (42.5%) were females. According to Physical Status Classification System,¹¹ 535 (53.5%) were of ASA class III (Table 1). Out of 1000 patients, 62% of patients had habits of either alcohol consumption, smoking or tobacco chewing or a combination

of them.

Table 1: Patient characteristics

Characteristics	Number (%) N=1000
Gender	
Male	575 (57.5)
Female	425 (42.5)
ASA status	
I	44 (4.4)
II	406 (40.6)
III	535 (53.5)
IV	15 (1.5)

In this study, 780 (78%) patients had elective surgeries whereas 220 (22%) patients had emergency surgeries. Intubation was easy in 823 (82.3%) patients while it was difficult in 177 (17.7%) patients (Table 2).

Table 2: Distribution of study participants according to type of surgery, difficulty level of intubation and anaesthesia technique

Variable	Number (%) N=1000
Type of surgery	
Elective	780 (78.0)
Emergency	220 (22.0)
Difficulty in intubation	
Easy	823 (82.3)
Difficult	177 (17.7)
Anaesthesia technique	
TIVA	200 (20.0)
GA	735 (73.5)
GA + EPI	29 (2.9)
GA + Block	36 (3.6)

(TIVA = total intravenous anaesthesia, GA = general anaesthesia, EPI = epidural anaesthesia, Block = peripheral nerve block)

Most of the cases, 800 (80%) were conducted under general anaesthesia with or without regional anaesthesia techniques and 200 (20%) were given total intravenous anaesthesia (TIVA). As per the data regarding administration of anaesthetic medications by intravenous or inhalational route, it was observed that all 1000 patients were given intravenous fpropofol in 891(89.1%) patients. Most commonly used inhalational agent was sevoflurane and air mixture in 541 (54.1%) patients. 766 patients received muscle relaxant, either vecuronium or atracurium, whereas 234 (23.4%) patients did not receive any muscle relaxant. No intra-operative complications were seen in 844 (84.4%) patients while hypotension was seen in 77 (7.7%) patients, bleeding was seen in 47 (4.7%) and hypoxia was seen in 25 (2.5%) patients (Table 3).

In the present study, 997 (99.7%) patients didn't have any form of awareness during anaesthesia while 2 (0.2%) patients had dreaming during anaesthesia and one patient confirmed hearing voices during surgery, which was considered as possible awareness according to definition. The incidence of possible awareness in present

Table 3: Occurrence of intraoperative complications

Intra-operative complications	Number (%) N=1000
No complications	844 (84.4)
Hypotension	77 (7.7)
Bleeding	47 (4.7)
Hypoxia	25 (2.5)
Arrhythmia	2 (0.2)
Hypotension + Bleeding	4 (0.4)
Hypotension + Anaphylaxis	1 (0.1)

study was 0.1%. Experience of being anaesthetized was satisfactory according to 937 (93.7%) patients while it was unsatisfactory according to 63 (6.3%) patients. (Table 4)

As per the Modified Brice's Questionnaire, last thing the patients remembered before going to anaesthesia was feeling of face mask in 250 patients, hearing voices in 194 patients and being with family in 184 patients.

215 patients remembered feeling of breathing tube and 151 patients remembered feeling of mask on the face as the first thing after waking up.

205 (20.5%) patients voted feeling anxious as the worst thing about their operation and 200 (20%) patients voted difficulty in movement as the worst thing.

99.7% of patients did not remember anything between going to sleep and waking up. Only 2 patients had feeling of anxiety or stress and 1 patient remembered hearing some voices. Incidence of unsatisfactory anaesthesia experience was higher (15.9%) in patients who underwent emergency surgical procedures in comparison to elective surgical procedures where the incidence was 3.6%.

4. Discussion

Awareness under anaesthesia is defined as "when the patient stated and remembered that he or she had been awake at a time when consciousness was not intended".¹⁰ Awareness under anaesthesia is multifactorial and can be caused by patient related factors, surgical factors and pharmacological factors.

In the present study, 1000 participants were included, who were posted for elective or emergency surgeries or procedures under general anaesthesia. Awareness during general anaesthesia was assessed and 53.5% patients belonged to ASA class III in contrast to other studies^{10,12} where ASA class I and II patients were assessed. In 93.7% of cases anaesthesia experience was satisfactory whereas in 6.3% of cases it was unsatisfactory.

In the present study 997 (99.7%) patients did not have any form of awareness during anaesthesia while 2 patients (0.2%) had dreaming during anaesthesia and 1 patient (0.1%) remembered hearing voices during anaesthesia (possible awareness). The only 2 patients who had dreaming during anaesthesia underwent emergency surgery and belonged

Table 4: Awareness during anaesthesia and anaesthesia experience by surgery type

Variable	Number (%) N=1000	Surgery Type		P value
		Elective	Emergency	
Awareness during anaesthesia				
No awareness	997 (99.7)	780	218	0.048
Dreaming	2 (0.2)	0	2	
Possible awareness	1(0.1)	1	0	
Anaesthesia experience				
Satisfactory	937 (93.7)	752	185	<0.001
Unsatisfactory	63 (6.3)	28	35	

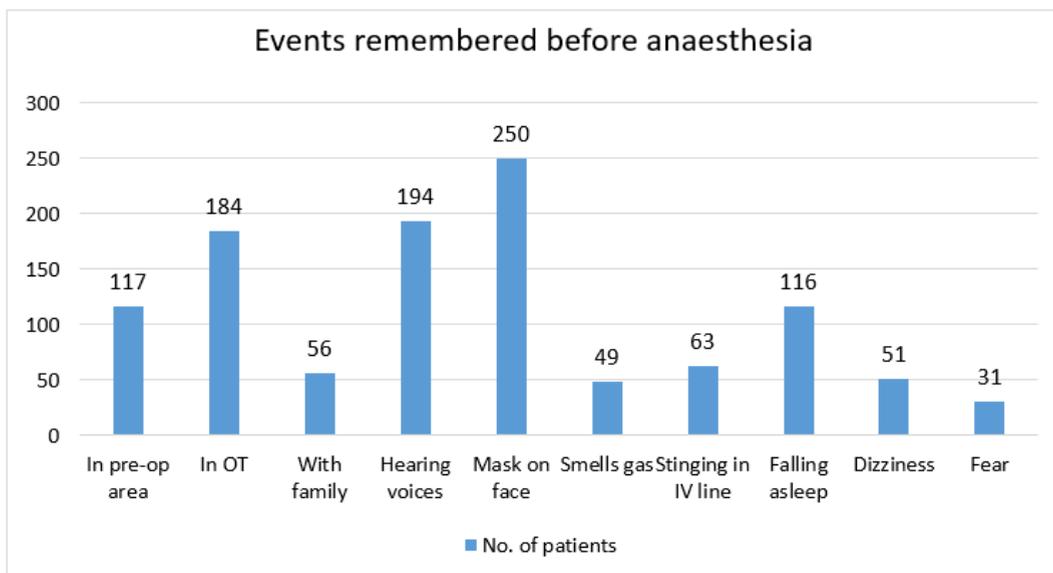


Fig. 1: Events remembered before anaesthesia

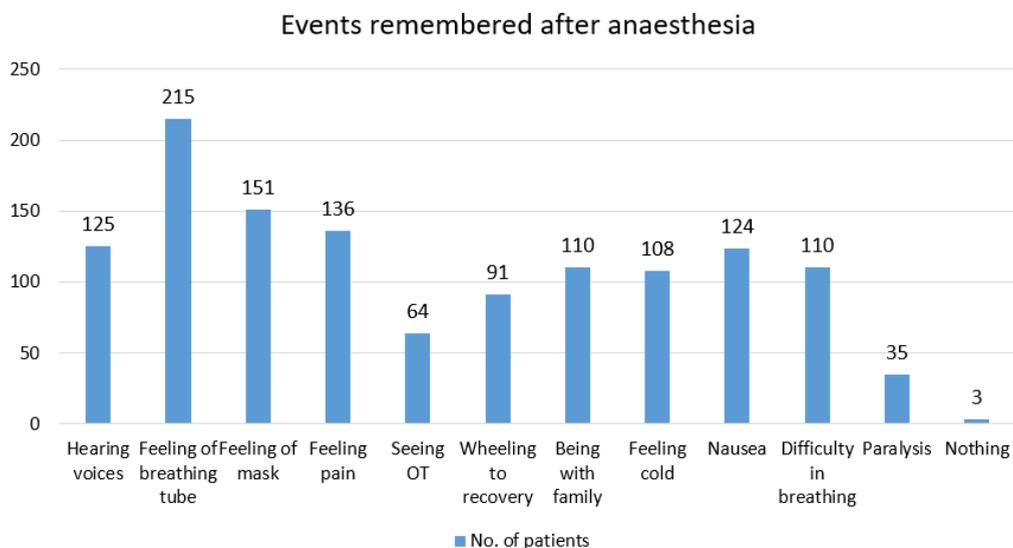


Fig. 2: Events remembered after anaesthesia

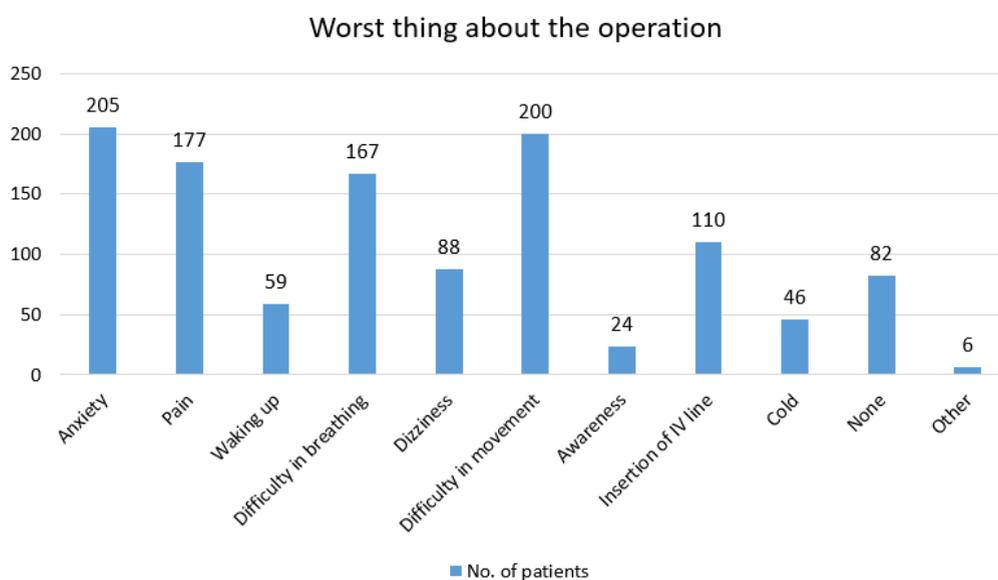


Fig. 3: Worst thing about the operation

to ASA III class. Both of these 2 patients had intra-operative hypotension. The association between surgery being planned/emergency and awareness of anaesthesia was found to be statistically significant by Fisher's exact test ($p=0.048$). We could not find any statistical association between awareness during anaesthesia with intubation being easy or difficult. There was also no association found between awareness and habits like alcohol, tobacco or smoking ($p>0.05$). Association between surgery being elective or emergency and anaesthesia experience being satisfactory or otherwise was found to be statistically significant with more of emergency patients reporting of not being satisfied of the anaesthesia experience ($p<0.001$) (Table 4).

These patients were referred to in hospital psychiatric department and received counselling. Frequent follow up of the patients were done and none of the patients had any anxiety related psychological complications. We have further studied all 3 cases and found out that the 2 patients who had dreaming under anaesthesia, belonged to ASA III. Out of these 2 patients, one patient was posted for emergency laparotomy for haemoperitoneum and the other patient was posted for atonic post partum haemorrhage. Both these patients received thiopentone sodium and ketamine as induction agents, injection succinyl choline and atracurium as muscle relaxants, fentanyl and oxygen+air+sevoflurane mixture. These patients had intra-operative bleeding and hypotension, during which sevoflurane was turned off for about 30 minutes. The one patient who had possible awareness belonged to ASA IV, was posted for elective coronary artery bypass grafting. Etomidate was used as an induction agent and other drugs

were similar as above. It was difficult to wean off the patient from bypass machine and patient had episodes of arrhythmia and hypotension. Occurrence of dreaming and possible awareness in these 3 patients might be due to reduced inhaled fraction of sevoflurane during the time period of hypotension. Interview of these 3 patients were conducted in ICU 12 hours postoperatively. So we can conclude that incidence of dreaming and possible awareness might be related to emergency surgery, female gender, higher ASA grade and occurrence of peri-operative complications leading to dose modification of anaesthetic drugs. These conclusion is similar to a review article describing risk factors for intra operative awareness.¹²

In several studies^{13–16} about awareness under anaesthesia done all around the world, incidence of awareness was found to be in the range of 0.13% to 1%, whereas in our study incidence of awareness is found to be 0.1% and that too a case of possible awareness and not a case of definite awareness. Here dreaming is considered as a separate entity which is in accordance with the study conducted by Samuelsson P. et al.¹⁷ In this study, out of 1000 patients 800 patients were given general anaesthesia with or without regional anaesthesia whereas 200 patients were given total intravenous anaesthesia (TIVA). Interviews of all the patients were conducted by the anaesthesia consultants when patients were fully awake, conscious, oriented, pain free and willing to give answers. This is important because time of interview and approach of interviewer towards the patients is important to draw unbiased opinions. In our study, use of fentanyl, dexmedetomidine, midazolam, sevoflurane, desflurane as a part of balanced anaesthesia technique with multimodal perioperative analgesia seems to

be effective in prevention of awareness during anaesthesia and making the anaesthesia experience satisfactory even in the most vulnerable cases. According to our study, 6.3% of patients had unsatisfactory anaesthesia experience. Occurrence of unsatisfactory anaesthesia experience was higher (15.9%) in emergency surgery in comparison to elective surgery where incidence was 3.6%. Patients getting operated in an emergency situation are more critical and anxious. We, as anesthesiologists, can definitely give a little more time talking with such emergency patients so as to alleviate their anxiety and distress, which in turn may make their anaesthesia experience satisfactory. Apart from psychological consequences medicolegal implications of awareness during anaesthesia must also be considered. According to NAP 5 study, accidental awareness under general anaesthesia accounted for 12% of all anaesthesia related claims and more than 20% of all claims relating to general anaesthesia. Sandhu et al described various contributory factors predisposing to intraoperative awareness and suggested the preventive measures for the same.¹⁸ In summary, we suggest that practice of balanced anaesthesia along with perioperative counselling can definitely reduce the incidence of awareness during anaesthesia.

5. Conclusion

Awareness under anaesthesia, though being an infrequent complication, can cause several psychological and medicolegal consequences. Balanced anaesthesia not only includes amnesia, analgesia, muscle relaxation and unconsciousness but it also includes perioperative counselling of the patients and giving them the outline of the entire process of being anaesthetised. Perioperative empathetic approach towards the patients reduces the anxiety, speculations regarding surgery and anaesthesia and this helps in minimizing the incidence of awareness during anaesthesia.

6. Source of Funding

None.

7. Conflict of Interest

None.

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