Original Article

Incidence of awareness in patients undergoing elective surgeries during general anesthesia

Prerana N Shah[1], Niranjan H R[1], Suvankar Das[1]
[1]*Department of Anaesthesiology, Seth GSMC & King Edward Memorial Hospital, Parel, Mumbai, Maharashtra, India*

Corresponding Author
Prerana N Shah
E-mail ID: pps@kem.edu

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Abstract

Introduction: General Anesthesia (GA) is reversible loss of consciousness. Awareness occurs when there is an explicit recall of intraoperative events with or without pain. It can cause distress, anxiety, chronic fear, depression, post-traumatic stress disorder, etc. There is an increasing concern over claims regarding awareness during anesthesia. **Materials and Methods:** The study was done on 188 patients. GA was administered as needed using Total Intra Venous Anaesthesia (TIVA), Mask, Supra glottic device, or Endo Tracheal Tube (ETT). Patients were encouraged to report any awareness in any form during the entire procedure voluntarily and were also directly questioned through a structured questionnaire in the recovery room, one hour and 24 hours after surgery. **Results:** Eighty-four females and 104 males with a mean age of 39.9 years constituted the study. In all, 89.3% of subjects underwent general anesthesia with ETT, 7.4% with a supraglottic device, and 2.1% and 1% with mask and TIVA, respectively. Patients recalled events just before induction (holding an oxygen mask-49%, receiving a painful injection-21%) and soon after emergence (shifting to a trolley-26.3%, holding an oxygen mask - 17.2%) but did not complain of intraoperative awareness. No incidence of awareness was reported by any patient or at direct questioning. **Conclusion:** There was no incidence of awareness in any patient in our study.

Key words: Anesthesia, awareness, recall, operation

Introduction

"I won't wake up during the operation, will I doctor?"[(1)]; this is the most common question encountered by anesthesiologists during their pre-operative visits, thus reflecting the deep anxiety and fear among patients. General Anesthesia (GA) is a continuum of progressive sedation, analgesia, amnesia, loss of protective reflexes, muscle relaxation, and cardiovascular depression.

Awareness during anesthesia (unintended intra-operative awareness) occurs when a patient can recall some or all of the events happening during a surgical procedure[(2)].

Explicit recall involves information and experiences we can consciously recall that were learned. Implicit memory may last a lifetime, even in the absence of effort. It involves perceptional and emotional unconscious memories. This may affect patients.

Various studies regarding awareness during anesthesia report an incidence of 0.5-2%[(3-5)] [US – 0.1 to 0.2%[(6)] and Europe – 0.1 to 0.18%[(7)]][(8-10)]. Data in Indian cancer patients at high risk for intra-operative awareness suggested that it is an uncommon occurrence[(11)]. Patient-related risk factors include female sex, previous history of awareness, younger age group (<65 years), addiction, hemodynamically unstable patient, and use of neuromuscular blockers. The major causes of awareness are apparatus dysfunction, wrong administration of drugs (labeling error, syringe swap), the lighter plane of anesthesia in critical patients, difficult intubation, and higher anesthetic requirement (subjective and substance abuse). *American Society of Anesthesiologists (*ASA) closed claims analysis and British data, both reported that about 2% of claims against anesthesiologists were due to awareness during general anesthesia[(12,13)]. Awareness is a patient-reported outcome; hence, its detection may be subjective. This may be a neglected aspect in a public institute with large workloads. Hence the need for a study was felt.

Aims and Objectives

Primary: To detect an incidence of intra-operative awareness with explicit recall among patients under general anesthesia

Secondary: To detect the phase of anesthesia where awareness occured

Materials and Methods

The study was conducted in 2015-2016. After written informed consent, 188 adult patients belonging to ASA grade 1, and ASA grade 2 undergoing general anesthesia for non-emergent surgery were selected. Patients unwilling to take part in the study were excluded. Patients were given anesthesia as required for the procedure and were grouped into four categories as patients under anesthesia using Total Intra Venous Anaesthesia (TIVA), Face Mask, Supra glottic device, or Endo Tracheal Tube (ETT). General anesthesia was given with or without an airway device. We decided to study patients undergoing anesthesia with or without Total Intravenous Anesthesia (TIVA) and using airway devices. Amongst airway devices, Endotracheal Tube (ETT), face mask, and Supraglottic Airway (SGA) were used during the procedure. Standard anesthesia techniques as practiced in the institute were used during the procedure. Clinical monitoring and conventional minimum monitoring like Electrocardiogram (ECG), blood pressure, heart rate,

capnography, and pulse oximetry were used as per the photocall. However, These Parameter were not used for analysis.

All the patients were encouraged to report any incidence of awareness during general anesthesia and were interviewed using Brice structured interview (modified)[14] one hour after regaining consciousness and 24 hours later.

Questions asked were

1) Before going to sleep, what do you recollect and after awakening in morning what came to your mind first?
2) Do you recollect of having a dream? If so, can you remember and give details.
3) If your experience of the surgery was bad, what were the issue?

Sample size

To place the available sample size in context, we estimated the sample size required to measure a plausible degree of inter-rater reliability with acceptable precision

The sample size required to measure an Intraclass Correlation Coefficient (ICC) of 0.41 (moderate agreement) with a lower two-sided 95% Confidence Interval (CI) excluding an ICC of 0.21 (fair agreement) with 90% power was 171.

$$n = \frac{z_1^2 - \frac{\alpha p}{2}(1-p)}{d^2}$$

p = Expected proportions = 2%[14,15]

d = absolute precision =2%

$1 - \frac{\alpha}{2}$ = desired confidence level = 95%

Considering 10% dropouts, the sample size was 188.

Statistical Analysis

Continuous data were described as median (IQR [range]) and categorical data as percentage for binomial or Poisson distributions, as appropriate.

The study was approved by Institutional Ethics Committee on 25 February 2015.

Results

No incidence of awareness was reported by any patient or at direct questioning. The duration of anesthesia ranged from 15 minutes to 2 hours. Eighty-four females and 104 males with a mean age of 39.9 years constituted the study participants. The age ranged from 18 to 58 years. In all, 89.3% of subjects underwent general anesthesia with ETT, 7.4% with the supraglottic device, and 2.1% and 1% with mask and TIVA, respectively. Patients recalled events just before induction (holding an oxygen mask – 49%, receiving a painful injection – 21%) and soon after emergence (shifting to a trolley – 26.3%, holding an oxygen mask – 17.2%) but did not complain of intraoperative awareness.

Table 1: Demographic data

Parameters								
Age (years) (mean±SD)	**Gender n (%)**		**ASA n (%)**		**Type of GA technique n (%)**			
	Males	**Females**	**I**	**II**	**ETT**	**SGA**	**TIVA**	**Mask**
39.95 ± 13.41	104 (55.31)	84 (44.68)	124 (65.95)	64 (34.04)	168 (89.36)	14 (7.44)	2 (1.06)	4 (2.12)

Abbreviations: ASA: American Association of Anesthesiologist Grade, GA: General Anesthesia, ETT: Endotracheal Tube, SGA: Supraglottic Airway, TIVA: Total Intravenous Anesthesia

Discussion

General anesthetics suppress cortical activity in a dose-dependent fashion, most commonly in ascending reticular system. Awareness became clinically important after the use of muscle relaxants and the practice of 'balanced' anesthesia. Awareness is a major medico-legal liability to an anesthetist, causing a wide range of patient morbidity. The most common complaints are auditory perceptions, hearing conversations and sounds, the sensation of paralysis, feeling surgery without pain, tracheal intubation, anxiety, helplessness, pain, and panic[4]. Majority of recall of events were recorded in the maintenance phase. Unpleasant after-effects documented were sleep disturbances, nightmares, dreams, flashbacks, anxiety, irritability, post-traumatic stress disorder, and preoccupation with death[16].

Classification of awareness:

It is classified by Griffith and Jones[17] as follows:

1. Conscious awareness with a complaint of pain perception
2. Conscious awareness with explicit recall but without pain
3. Conscious awareness or "wakefulness" (ability to respond to simple verbal commands)
4. Without explicit recall and pain but possible implicit memory
5. Subconscious awareness without explicit recall but evidence of implicit memory of intraoperative events

6. No awareness

Previously, the depth of anesthesia was assessed by the level of anesthesia required to avoid movement to painful stimulus while maintaining spontaneous respiration. With the advent of muscle relaxants, it became possible to achieve surgical anesthesia with a lighter plane of anesthesia. Balanced anesthesia refers to the critical balance between all the components of anesthesia, i.e., analgesia, amnesia, unconsciousness, and muscle relaxation using multiple drugs. The occurrences of awareness continue to happen even in modern anesthetic practice. Awake paralyzed state refers to the occurrence of awareness in a patient who is out of sedation but has muscle relaxation, which is believed to be a dreaded experience. Effects of drugs used for induction of general anesthesia on various systems limit the doses of drugs that can be safely administered, thus providing various depths of anesthesia in critical patients. Our study was composed of 104 males and 84 females. All the subjects who underwent general anesthesia with ETT (n = 168) received neuromuscular blockers, while those with SGA, mask, and TIVA did not. All the patients in the study belonged to ASA Grade I and II and hence had no limitation of overuse of anesthetic agents.

Monitoring Depth Of Anesthesia (DOA) includes clinical monitoring of blood pressure (P), heart rate (R), sweating (S), lacrimation (T) – PRST or Evans score[18]. Other depth monitors include end-expiratory volatile anesthetics concentration monitoring, Bispectral Index (BIS), Narcotrend, Entropy, cerebral state index, and evoked brain electrical activity monitors (somatosensory, visual, and auditory evoked potentials). A more simple and effective method is the postoperative structured interview to detect awareness. Though the use of depth of anesthesia monitors is not recommended for all cases under general anesthesia, it is advisable to be used in patients with risk factors for awareness. However, the limitation being the use of DOA monitors does not ensure the prevention of awareness in practice.

ASA Taskforce recommendation about monitoring

Depth of Anesthesia

1. Monitoring includes clinical monitoring and looking for a reflex response[18,19]. Conventional minimum monitoring like ECG, blood pressure, heart rate, capnography, and pulse oximetry can aid in monitoring the depth of anesthesia.
2. Cerebral activity using BIS or entropy is recommended only for selected patients like trauma surgery, cesarean delivery, and if only total intravenous anesthesia is used.

In our study, standard monitoring with electrocardiogram, blood pressure, heart rate, capnography, and the end-tidal anesthetic agent was carried out, along with clinical monitoring for DOA. DOA monitors were not used because of unavailability.

The increasing trend of claims regarding awareness in 1990 (2%) compared to 1970 (1%) in ASA closed claim analysis reflects a growing public awareness about awareness rather than an increase in incidence. Awareness of recall is considered to be substandard care on the part of the anesthesiologist. Incidence of awareness was < 1 in 300 - bedded (0.33%) tertiary cancer care referral hospital[11].

Patients attending our public institute belong to a middle and low socio-economic group, mostly uneducated or minimally educated patients. Lack of awareness about types of anesthesia, and knowledge about what to expect in general anesthesia, might have contributed to under-reporting by the patients. However, these factors were not studied. Under-reporting due to fear of disbelief, ridicule, fear of insanity or dementia & misunderstanding of events is of common occurrence[16]. Most patients mentioned "pain" as the most feared experience of surgery; however, on careful questioning, they referred to postoperative pain.

It is possible that emotional injury is under-reported than physical injury. Patients might attribute their psychological changes to a long hospital stay, the pressure of being away from work, and morbidity due to loss of earnings rather than implicit recall. The limitations of our study were the lack of use of monitoring for measuring the depth of anesthesia due to non-availability.

Conclusion

There was no incidence of awareness during general anesthesia in our study. However, patients could recall events just prior to loss of consciousness.

Conflict of Interest: Nil

Source of Support: Nil

ORCiD

Prerana N Shah 0000-0001-7068-2420

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