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INCIDENCE OF INTRAOPERATIVE AWARENESS DURING GENERAL ANAESTHESIA AND ANALYSIS OF PROBABLE RISK FACTORS

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ABSTRACT

BACKGROUND: Accidental awareness during intended general anaesthesia with postoperative explicit recall can be a devastating experience for patients, frequently leading to post traumatic stress disorder. The low incidence of awareness during anaesthesia makes it difficult to assess risk factors and even current prospective cohort studies have problems identifying exact causes. Recently, cases of awareness reported by the fifth National Audit Project (NAP5), suggests that the current incidence in the UK is about 1 in 15,000. This is much lower than the 1 to 2 per 1,000 incidences that has been found in several prospective studies that have assessed awareness with recall. This study has been undertaken to estimate the incidence of accidental awareness during general anaesthesia in our hospital and to analyse the probable risk factors by interviewing the patients after recovery from general anaesthesia.

METHODOLOGY: A total of 750 patients who underwent diverse surgeries under general anaesthesia over a three month period were assessed. Perioperative data and intraoperative drugs were collected prospectively for logistic regression analysis. Patients were interviewed twenty four and forty eight hours after recovery from general anaesthesia. The structured interview was done by the research staff, based on the Brice Questionnaire and descriptive analysis was done by a blinded team for unintended awareness.

RESULTS: None of the 750 patients reported awareness or possible awareness. Only one female patient reported pleasant dreaming after short duration of propofol anaesthesia.

CONCLUSIONS: This study was the first in our hospital attempted to identify cases of awareness. The incidence of conscious awareness following the general anaesthesia protocol in our hospital was found to be negligible when interviewed up to second postoperative day. Based on the existing literature, we have also made a brief review of the risk factors of awareness and the strategies to be implemented to prevent the same.

KEYWORDS :

INTRODUCTION

The word anaesthesia comes from the Greek word *an aesthesis* meaning "without sensation". Technically, anaesthesia is a continuum whereby consciousness, recall and reflexes (both somatic and autonomic) are gradually lost.

Awareness generally occurs where there is an imbalance between the depth of anaesthesia and the stimulus to which a patient is exposed. "Explicit awareness", refers to the conscious recollection of events, either spontaneously or as a result of direct questioning. "Implicit awareness", refers to implicit memories existing without conscious recall but they can alter patients' behaviours after the event. Awareness can be complicated by a spectrum of psychological symptoms that are dependent upon both the individual patient and their specific experience. These may range from anxiety, fear of surgery or anaesthesia and sleep disturbances to flashbacks, nightmares and post-traumatic stress disorder or depression. [1] Consequences for the anaesthesiologist include distress and medico-legal implications. An analysis of the American Society of Anesthesiologists (ASA) Closed Claim Project showed that 1.9% of claims were for awareness and blamed substandard care, specifically, deficiencies in drug labelling and administration. [2] Large trials have demonstrated that around 1 to 2 per 1000 patients experience some form of awareness. [3, 4] One of the difficulties in identifying the true incidence of awareness is the ability to detect it accurately and specifically. An acknowledged and well established method of detecting awareness involves the use of a structured Brice interview. [5]

This study has been undertaken to estimate the incidence of accidental awareness during general anaesthesia in our hospital and to analyse the probable risk factors by interviewing the patients after recovery from general anaesthesia.

METHODOLOGY

After obtaining ethical clearance, 800 patients of Father Muller Medical College Hospital posted for various surgeries under general anaesthesia was enrolled in this prospective study for 3 months. The sample size was calculated by using an estimated population prevalence technique based on data derived from previous studies. All consented patients were above the age of 18 years without any previous history of psychiatric illness. Patients who were not extubated within 24 hours, patients who were shifted to ICU, patients who had delirium postoperatively and patients who were not able to communicate normally were excluded from the study.

Pre anaesthetic evaluation was done for all patients and written informed consent was taken. The technique of inducing anaesthesia, the perioperative drugs used, the monitors used and the overall anaesthetic management was at the discretion of the individual anaesthesiologist in charge of the particular patient. The perioperative data and the drugs used were collected prospectively and the necessary details were documented as per the attached proforma. Data collection included basic patient characteristics data (age, sex, weight, ASA physical status and type of surgery), details of induction and maintenance of anaesthesia, use of sedative premedication, use of tracheal intubation or laryngeal mask, use of neuromuscular blocking agent, regional anaesthesia, duration of anaesthesia and any other untoward intraoperative events. Patients who were mentally in a position to communicate freely were interviewed by the research staff, 24 and 48 hours after the surgery. The questions asked were according to a structured interview that was used in previous incidence studies based on the modified Brice Questionnaire (Table1). Each patient was categorized into four groups as- no awareness, dreaming, possible awareness and awareness (Table2).

Descriptive statistics was used to describe the incidence of awareness. The negligible number of true awareness cases precluded comparative analysis with the non-awareness group.

RESULTS

Around 800 patients were enrolled in the study but only 750 patients completed the inclusion criteria. There were 438 male (58.4%) and 312 female (41.6%) patients. All 750 patients underwent elective surgery and hence all of them were premedicated with diazepam before the

surgery. Isoflurane was used as the inhalational agent in all cases along with nitrous oxide and oxygen. All patients received intravenous fentanyl intraoperatively and intravenous paracetamol post operatively. 662 patients (88.2%) received muscle relaxants. Endotracheal tube was used in 617 patients (82.2%) , Laryngeal mask airway in 113 patients (15%) and face mask in 20 patients (2.6%). 303 patients (40.4%) underwent surgery of more than 2 hours duration. Out of the 750 patients, no patient reported to have awareness during general anaesthesia. Only one patient reported to have dreaming when interviewed immediately after surgery.

DISCUSSION

Awareness with recall (AWR) after general anaesthesia is an infrequent, but well described, phenomenon that may result in post traumatic stress disorder. There are no previous data about the incidence of this complication in our hospital where we perform around three hundred to four hundred surgeries under general anaesthesia every month. We therefore undertook this prospective study to determine the incidence of awareness with recall following general anaesthesia in Father Muller medical college hospital over a three month period. Two large multicentre studies on awareness reported in literature was by Sandin et al. and Sebel et al. [3, 4]

Sandin et al. reported an overall incidence of 0.16% in 11,785 patients treated at two hospitals in Sweden; the rate was 0.18% when neuromuscular blocking drugs were used and was 0.11% in their absence. Data from 19,575 patients reported by Sebel et al. in the United States identified 25 cases of true awareness (0.13% incidence). These occurred at a rate of 1–2 cases per 1000 patients at each centre. [3, 4] In a study from Australia, Myles et al. reported an incidence of awareness of 0.10%; it was the highest risk factor for patient dissatisfaction after anaesthesia. [6]

Most of the available literature on awareness with recall usually quotes the above incidence of 1-2 cases per 1000 patients. In a joint publication in British Journal of Anaesthesia and Anaesthesia, Pandit and colleagues report the results of the first phase of the 5th National Audit Project (NAP5) of the Royal College of Anaesthetists in collaboration with the Association of Anaesthetists of Great Britain and Ireland. The findings of the first phase of NAP5 prompt a reconsideration of the detection and incidence of AWR. [7, 8] Based on cases of awareness that became known to anaesthetists during 2011, the survey suggests that the current incidence of AWR in the UK is about 1 in 15,000. This is much lower than the 1 to 2 per 1,000 incidences that has been found in several prospective studies that have assessed AWR. In 2007, Pollard and colleagues described a study of AWR in a regional medical system in the US and found an incidence of approximately 1 in 15,000, which is commensurate with the findings of the NAP5 survey. [9] This dramatically lower incidence was attributed either to differences in anaesthetic technique or to the method of assessing awareness.

Out of the 750 patients assessed in our study, no cases of awareness with recall were elicited after following the present protocol of administering general anaesthesia in our hospital. Considering the globally low reported incidence of awareness, our result holds good. We did however elicit one case of dreaming. A young female patient posted for day care rectal examination under anaesthesia, reported pleasant dreaming following awakening with propofol, fentanyl and spontaneous mask ventilation with sevoflurane. Dreaming during anaesthesia is defined as any recalled experience (excluding awareness) that occurred between induction of anaesthesia and the first moment of consciousness upon emergence. Dreaming is a commonly-reported side-effect of anaesthesia. The incidence is higher in patients who are interviewed immediately after anaesthesia (approximately 22%) than in those who are interviewed later (approximately 6%). Most dreaming occurs in younger patients, who receive propofol-based ambulatory anaesthesia and who emerge rapidly from anaesthesia. Their dreams are usually short and pleasant related to work, family and recreation and are not related to inadequate anaesthesia. [4, 10]

Intraoperative awareness under general anaesthesia is an important clinical problem that clearly is within the foundation of training and continuing medical education in anaesthesiology. The ASA(American Society of Anesthesiologists) task force has formed a practice advisory which focusses on the need to identify risk factors that may be associated with intraoperative awareness, provide decision tools that may enable the clinician to reduce the frequency of unintended intraoperative awareness, stimulate the pursuit and evaluation of strategies that may prevent or reduce the frequency of intraoperative awareness, and provide guidance for the intraoperative use of brain function monitors as they relate to intraoperative awareness. [11]

While the incidence of anaesthesia awareness is very low, there is a greater incidence in cardiac surgery (1.1-1.5%), obstetrical surgery (0.4%) and major trauma surgery (11-43%). [12] Various studies have reported risk factors associated with awareness during general anaesthesia and most studies conclude overly light plane of anaesthesia at the time of the episode, to be the primary risk factor. Table 3 includes (but not limited to) the situations associated with a higher risk of unintended awareness gathered from literature. [13-17] Regardless of the cause, affected patients may express their experience with an episode of anaesthesia awareness in differing ways. Auditory and tactile sensory perceptions are the most commonly reported sensations by patients who have experienced anaesthesia awareness. Some patients have reported experiencing pain, visual images of their surroundings, or being awake and paralyzed without being able to communicate their situation. While not every episode of anaesthesia awareness is associated with negative recollections, it appears that more than half of these experiences include some degree of mental distress. [18] In some situations, patients who initially claim in the early postoperative period to have no after-effects due to an episode of anaesthesia awareness may still be at risk of developing subsequent psychological disability many years later. [16] Strategies which every anaesthesiologist must try to implement to minimise the risk of awareness is summarised in Table 4. [2, 19, 20,] When conducting a postoperative assessment for unintended awareness, a structured interview using the Brice-modified questionnaire should be used with all patients. Anaesthesia professionals should be cognizant that the onset time of psychological symptoms varies widely from 7 to 243 days after surgery and the median duration of psychological symptoms ranges from 4.4 to 5.6 years. [4, 21]

It is important that an institution policy on this issue describe the preventive and therapeutic steps that should be taken when an occurrence of anaesthesia awareness has been discovered.

CONCLUSION

This study was the first in our hospital attempted to identify cases of awareness. The incidence of conscious awareness following the general anaesthesia protocol in our hospital was found to be negligible when interviewed up to second postoperative day. However further studies with larger number of cases need to be done where patients can be followed up and interviewed even weeks later to assess the true incidence. Based on the existing literature, we have also made a brief review of the risk factors of awareness and the strategies to be implemented to prevent the same.

MODIFIED BRICE QUESTIONNAIRE	
1.	What is the last thing you remember before going to sleep?
2.	What is the first thing you remember waking up?
3.	Do you remember anything between going to sleep and waking up?
4.	Did you dream during your procedure?
5.	What was the worst thing about your operation?

TABLE 1. MODIFIED BRICE QUESTIONNAIRE

AWARENESS CATEGORIZATION	
1.	No awareness: no reported awareness or a vague description, or what had been reported had a high probability of occurring in the immediate pre- or postoperative period; i.e., music, people talking, dressing application
2.	Dreaming, possibly associated with awareness
3.	Possible awareness: patient unable to recall any event definitely indicative of awareness
4.	Awareness: recalled event was confirmed by attending personnel, or the investigators were convinced that the memory was real, but no confirmation could be obtained

TABLE 2. FOUR CATEGORIES OF AWARENESS

- Use of low-dose anaesthesia due to the patient's condition
- Acute trauma with hypovolemia
- Caesarean section under general anaesthesia
- Impaired cardiovascular status
- Cardiac surgery, including off pump
- Expected intraoperative hypotension
-
- Increased anaesthetic requirements of some patients
- Younger age
- Tobacco smoking
- Chronic use of benzodiazepines, opioids or amphetamines
- Known or suspected heavy alcohol intake
-
- Malfunction or misuse of anaesthesia delivery system
- Empty vaporizer
- Malfunction of vaporizer or gas analyser
- Breakdown of machine or pump devices
- Disconnection of catheter tubing
-
- Difficult or prolonged intubation
- Physical Status III, IV, and V patients
- Past history of awareness
- Severe end-stage lung disease
- Total intravenous anaesthesia
- Obesity
- Surgery occurring at night
- Total paralysis with muscle relaxants

TABLE 3. The situations that have been commonly associated with a higher incidence of unintended awareneness.

- Conduct a pre anaesthetic evaluation to assess the patient's risk of anaesthesia awareness.
- Incorporate the possibility of anaesthesia awareness as part of the informed consent process for all high-risk scenarios. In cases where sedation and not general anaesthesia is going to be used, such as during regional anaesthesia or monitored anaesthesia care, discuss with the patient that it is not unexpected that he or she may hear or see things in the operating room.
- Conduct preventive maintenance on the anaesthesia machine, vaporizers and gas sampling equipment/monitors, and ensure the correct functioning of all anaesthesia delivery systems prior to each anaesthetic (e.g., infusion pumps, connections, emergency oxygen supply).
- Label all medications as they are prepared and read the label prior to administration to prevent drug error.
- Consider using a preoperative dose of an amnestic drug (e.g., benzodiazepine) if the patient's condition allows and when low-dose anaesthesia may be necessary due to the patient's condition.
- Provide additional doses of hypnotic drugs or initiate volatile agent administration, if not contraindicated, for repeated intubation attempts.
- Use an end-tidal inhalation agent monitor with a low threshold alarm setting to detect sufficient inhalation agent concentration.
- Continually assess patency of intravenous lines and function of infusion devices when administering total intravenous anaesthesia.
- Avoid excessive muscle relaxation unless surgically indicated and routinely monitor neuromuscular function and status to measure the degree of muscle relaxation.
- Consider the use of brain-function monitoring if available, particularly for high-risk scenarios.

TABLE 4. Strategies to be implemented in order to minimize the risk of anaesthesia awareness

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