

# Anesthesia Awareness “AWAKE” during Orthognathic Surgery: a Case Study and Review

Ranjitha RS<sup>1</sup>, Rohit<sup>2</sup>, Anshu Singh<sup>3</sup>, Jayanth BS<sup>4</sup>

## ABSTRACT

**Introduction:** The term “anesthesia awareness” (AA) signifies the specific surgical period of time when an individual, in spite of being under intended general anesthesia, remains aware of the sensory stimuli and the memories of which also remain available for his subsequent explicit recall in the future. Commonly reported consequences of AA are acute painful flashbacks of surgical events along with the emotional turmoil and a sense of helplessness followed later by posttraumatic stress disorder.

**Case report:** Here, we report a unique case of occurrence of “anesthesia awareness in a patient during orthognathic surgery.

**Conclusion:** Though incidence of anesthesia awareness is rare, but even a single incidence can be really devastating for the patient. When intraoperative awareness is suspected, the responsible anesthesia providers, their departmental administrators, and quality assurance team members should activate a series of interventions aimed at defining the nature of the event and its causes, while minimizing its impact by providing supportive care to patient.

**Keywords:** Anesthesia Awareness, “AWAKE”, Orthognathic Surgery

## INTRODUCTION

General anesthesia is important to surgical practice, rendering the patient amnesic, analgesic, and unconscious while enabling skeletal muscle relaxation, hypnosis, and decreased perception from all sensory modalities. Although no single drug is capable of eliciting these types of effects in a rapid, efficacious, and safe manner, a combination of pharmacologic drugs may be administered to achieve such results.<sup>1</sup> However, the ability to render patients insensate via general anesthetic medications has not always been a success. Inhaled anesthetics have long been touted as miracle drugs, enabling physicians to develop new advances in the surgical management of disease while eliminating the pain that accompanies such procedures.<sup>2</sup> However, failure of general anesthesia to render individuals completely insensible to surgical stimulation has resulted in some patient being aware of some or all of the events during their surgical operation. Anesthesia awareness, also known as unintended intraoperative awareness, occurs when patients recollect events of their surgical procedure.<sup>3</sup>

The introduction of anesthesia in mid-19th century has been hailed as one of the greatest advances in medicine, but its beginnings were not problem free. In 1845, Hoarce Wells attempted to demonstrate nitrous oxide anesthesia to physicians at Massachusetts general hospital in Boston, but his patients moved and cried out. Surgeons observing the procedure considered Well’s demonstration a failure, although the patient had no recall of his operation.<sup>4,5</sup> A year later, when W.T.G. Morton demonstrated the use of ether in the same venue, surgeons

observing the procedure considered it a ground breaking success.<sup>6</sup> Nonetheless, Morton’s patient, Gilbert Abbot, reported that he had been aware during his surgery, while experiencing no pain. The causes of these occasional failures of general anesthesia were probably elusive at the time but in retrospect we can identify several key features: lack of knowledge of anesthetic pharmacology and physiology, unfamiliarity with improved equipment, and minimal patient monitoring.<sup>7</sup> John snow was arguably the first to realize the importance of these issues and subsequently designed several anesthetic delivery systems, as well as describing a series of clinical sign to gauge adequate depth of anesthesia for surgery. This evolution of the specialty of anesthesia has been accompanied by a reduction in the reported incidence of awareness such that it was estimated to be about 1-2% in unselected patients in 1980’s and is now about 0.1%.<sup>2-6</sup>

## CASE REPORT

We encountered a case of intraoperative awareness during orthognathic surgery at Coorg Institute of Dental Sciences. A 29 year old healthy female patient came to the OPD with a chief complaint of gummy smile. Patient did not any give significant medical history except for one incidence, when she was admitted in general hospital for few days during her childhood as she was diagnosed with Jaundice. She recovered well and she didn’t had any problem after that. Intraoral examination and cephalometric tracing was done and patient was diagnosed with Apertognathia. Treatment planning was carried out in which segmental maxillary osteotomy with advance genioplasty was decided. Anesthetic fitness was obtained and patient was started on pre-op drugs

### Premedications

- Injbactoclav 1.2 gm
- Inj rantac 1 amp
- Inj odansetron 4mg
- Inj hydrocort 100mg
- Inj Midazolam 1mg
- Inj fortwin 20mg given IV

<sup>1</sup>Senior Lecturer, Department of Oral and Maxillofacial Surgery, Pacific Dental College and Hospital, <sup>2</sup>Senior Resident, Department of Oral and Maxillofacial Surgery, MGM Government Hospital, Jamshedpur, <sup>3</sup>Consultant, Department of Orthodontics and Dentofacial Orthopaedics, <sup>4</sup>Professor, Department of Oral and Maxillofacial Surgery, Coorg Institute of Dental Sciences, India

**Corresponding author:** Dr Rohit, Flat No: B/302, Arbindo Madhusudan Complex, Dimna Basti, Near Shiv Mandir, NH 33, Pin -831018. Jamshedpur, Jharkhand, India

**How to cite this article:** Ranjitha RS, Rohit, Anshu Singh, Jayanth BS. Anesthesia awareness “AWAKE” during orthognathic surgery: a case study and review. International Journal of Contemporary Medical Research 2017;4(6):1276-1279.

### Intraoperative

Patient was pre-oxygenated with 100% oxygen, General anesthesia was induced through i.v route using Thiopentone sodium and maintained via left nasotracheal intubation. Intra-op intermittent positive pressure ventilation (IPPV) with nitrous oxide and oxygen in ratio of 6:4 (N<sub>2</sub>O:O<sub>2</sub>). Intermittent Halothane 0.6-1% and Inj vecuronium 6mg +(1.5 mg×17)=31.5 mg IV was given throughout the procedure. Duration of surgery was around 4 hour. Inj neostigmine 3mg /iv was used as a reversal agent. Reversal and recovery was smooth, extubation was uneventful, Patient was well oriented, muscle power was good and reflexes were normal.

### Post –operative

patient was shifted to post anesthesia care unit (PACU), 6 th hourly post operative follow up was done. Patient complained of pain at the incision site and disturbed sleep. She was put on Inj inac 3cc/im (diclofenac sodium) and regular antibiotics along with tab anxit 0.5 mg (alprazolam). She gave the first hint of awareness to the nursing staff when she said that "I was awake during the procedure, but felt no discomfort"

On the third postoperative day during follow up, we had good conversation with the patient as she was able to speak much better and complained of mild pain. During the conversation she recalled the day of surgery and told us about the incidence of awakesness.

Structured interview was conducted by the operating surgeon and the nursing staff who were present on the day of surgery in the theatre and patient shared her experience.

### DISCUSSION

The post surgical assessment of intraoperative awareness under general anesthesia is not conducted very often. However it is well described by the patient and anesthesiologist as an adverse and undesirable effect. The term "awareness" is used in this article to describe conscious or explicit recall of the events during anesthesia.<sup>8</sup> Even to anesthetists, the term remains ambiguous as witnessed by frequently used synonyms like conscious recollection of awareness, awareness with recall,

and explicit awareness. The purpose of general anesthesia is to induce unconsciousness through the administration of drugs as it is fundamental to provide patients with analgesia, anxiolysis, amnesia and suppression of hormonal, cardiocirculatory and motor responses in the surgical stress setting.<sup>3,7</sup>

Awareness during anesthesia with intraoperative memory occurs when the patient is able to process information and recollect specific responses to several stimuli. Explicit or declarative memory is when the patient remembers facts, events or experiences that occurred during general anesthesia. Implicit or procedural memory is defined as the memory of motor and sensorial capacities and abilities wherein the patient is unable to verbally express his experience during anesthesia, but there are changes in his postoperative behavior, habits and performance in such a way that psychological tests are required to detect the implicit memory.

Dreaming is a phase that raises issues regarding the classification of the awareness type. Dreaming is considered to be a transitional state between the explicit and implicit memory. The experience of consciousness is not the same for all patients. These may be collected as memories (hearing perception, tactile sensation, difficulty to move and breath, panic, anxiety, chronic fever, insomnia and recurrent nightmares) or neurosis, also known as post-traumatic stress disorder. An awareness incidence of 1.2% has been documented in 1960, but recent studies show a remarkable drop to 0.1% to 0.2% which may change according to biological types, anesthetic drugs and applied surgical procedure.<sup>2,6</sup>

Risk factor for intraoperative awareness, according to epidemiological studies, may be classified in three main groups

- Patient related
  - Gender
  - Age
  - Body weight
  - Previous history of drug abuse, amphetamines, opioids
  - Physical condition of the patient
  - Difficult airway

Sl. No	Questions asked by the interview panel	Patient experience
1.	What was your overall experience	I was awake during the procedure for some time, but felt no pain neither any discomfort
2.	What was the last thing you remember before going to sleep	I felt some tube going inside my throat, but felt no discomfort, was scared, tried to move but found it impossible. Heard somebody saying "she is not asleep"
3.	What was the first thing you remember during your awake period	I heard someone saying "raise the table" One of the operating surgeon asked for "scalpel" Felt incision, realised what was happening and soon afterthat lost consciousness. Heard noise of the instruments Heard voices of the people over there but could not recall what they said. When i regained consciousness. Heard surgeon ask "can I cut bone here?" Felt someone manipulating my jaw. No pain and no anxiety. No further memories
4	Did you see anyone during your awake period?	No.

Table-1: Questionnaire

- Surgery type related
  - Obstetric anesthesia
  - Cardiac surgery
  - Emergency surgery in poly traumatized patients
- Anesthesia technique related
  - Intravenous versus inhaled anesthetics
  - Short acting muscle relaxants
  - Light anesthesia
  - Inadequate service and anesthesia delivery systems.

#### Patient related

**Gender:** Various studies have indicated that incidence of intraoperative awareness is thrice in females than in males mainly because females recover faster from anesthesia, which suggest that they may be less sensitive to the effects of anesthetic on the brain.

**Age:** In some studies, patients who suffered from awareness were younger than those who did not. The cause is probably the increased anaesthetic requirement compared to elderly patients. Age influences both MAC (minimum alveolar concentration) and MAC-Awake, a decrease of approximately 6–6.7% per decade. A relatively higher incidence of awareness has been reported in children.

**Body weight:** It has been suggested that there may be a higher incidence of awareness in obese patients. The presumed causes are the often prolonged time needed for endotracheal intubation and the use of light anesthesia due to derangements of the cardiopulmonary systems

Previous history of drug abuse, amphetamines, and opioids: Substance abuse patients may also be at increased risk for intraoperative awareness due to cross tolerance. These patients experience sympathetic nerve stimulation with significant episodes of hypotension related to hypovolemic state. The volume constricted state is caused by the intense vasoconstriction and hypertension from these agents which makes assessment of anesthetic depth difficult.

Physical condition and preanesthetic medication: There is an increased risk for intraoperative awareness in ASA III and IV patients who are submitted to major surgeries. Patients on antihypertensive drugs and beta blockers are susceptible to experience awareness episodes, if exposed to low doses of general anesthetic agents. Whereas the preoperative use of benzodiazepines reduces the incidence of awareness.

**Difficult airways:** The incidence of intraoperative awareness is seen more in cases with difficult endotracheal intubation. Patients who come under type III or IV according to Mallampati airway assesment, as well as patient with severe maxillofacial injuries and cervical bone fracture are more prone for awareness. Incidence of anesthetic awareness increases by 4.5% to 7.5%<sup>9</sup> in these type of patients.

#### Surgery related

Obstetric anesthesia: According to different literatures, incidence ranges from 0.4% to 1.3% and which occurs in the period between skin incision and fetal extraction, moment of greatest surgical stimulus and in many times with lower anesthetic concentrations.

Cardiac surgery: light anesthesia is commonly used during these

operations. The awareness incidence ranges from 1.1% to 23%, mainly in surgeries where cardiopulmonary bypass is used.

Emergency surgery in polytrauma patient: Anesthesia for trauma patients who are hypovolemic has a significantly increased risk of awareness. Hypovolemic patients become more hypotensive with the administration of anesthetic drugs because of interruption of compensatory sympathetic outflow. Bogetz and katz reported Intraoperative awareness incidence upto 11%- 43% in these type of patients.<sup>10</sup>

#### Anesthesia technique related

Intravenous versus inhalational anesthesia: Reported awareness cases with techniques using inhalation anesthesia in general seem to be associated with issues in vaporizers or lack of anesthetic gas monitoring on the other hand a prospective study conducted by Errando et al showed higher awareness incidence in patients who were administered total venous anesthesia as compared to balanced anesthesia.

Short acting muscle relaxants: A meta-analysis demonstrated that 85% of the patients suffering from awareness had received neuromuscular blocking agent. The use of neuromuscular blocking agents is associated with higher intraoperative awareness as well as with implicit memory.<sup>11,12</sup> The lowering of anesthesia agents at the end of procedure may result in unintentional intra operative awareness id done while the patient still has a large amount of muscle relaxation in the system that renders him/her unable to move.

Light anesthesia: Most important factor for awareness. Light anesthesia is intentionally employed in certain operations, in hypovolaemic patients, and patients with minimal cardiac reserve. Light anesthesia may also be inadvertently produced under several situations.

Inadequate service and checking of anesthesia delivery systems: Defective anaesthesia machines may result in inadequate concentrations of anaesthetics delivered to the patient. The precise delivery of inhalation anaesthetics depends on properly-working anaesthesia machines. Both simple machines and complex, computer-based integrated workstations need regular servicing by the manufacturer and trained technicians, as well as daily checks and checks before every anaesthetic administration. Intravenous anaesthetics may be administered through simple infusion systems or more sophisticated computer-controlled infusion pumps. Both systems need to be regularly serviced and checked.

#### The post-operative interview

It is important to assess postoperatively whether efforts to prevent awareness, in at-risk patients or indeed in all patients have been successful. The modified Brice questionnaire is suitable for this purpose: "What is the last thing you remember before you went to sleep?", "What is the first thing you remember when you woke up?", "Do remember anything in between?" and "Did you have any dreams?". In most patients, these questions can be combined with questions about pain, nausea and vomiting and satisfaction with anaesthesia care, without causing any distress to the patient. Patients whose experience may not have been awareness (such as those who remember dreaming or remember their experiences in the intensive care unit) can be reassured, whilst those who were aware can be referred for counselling.<sup>12,13</sup> The events can be discussed at departmental quality assurance

1.	What is the last thing you remember before surgery?
2.	What is the first thing you remember after surgery?
3.	Do you remember anything which happened during surgery?
4.	Did you have any dreams during surgery?
5.	What was the worst thing about your surgery?
<b>Table-2: Questionnaire</b>	

1.	Check equipment carefully before beginning of the procedure.
2.	Premedicate with amnestic agent, they synergize with anesthetics to prevent awareness. Also, if awareness occurs, psychological trauma is less likely without recall.
3.	Avoid muscle relaxants and minimize their use when needed.
4.	Avoid light induction doses. Re-bolus with intravenous hypnotic during multiple intubation attempts. Consider using inhalation induction technique.
5.	Supplement N2O/narcotic with volatile or propofol, if possible.
6.	Assure agent delivery using End-tidal gas monitors. Check drug infusion pumps frequently.
7.	Inform high-risk patients about awareness during general anesthesia, and consider doing so for all patients
8.	Routinely ask your post-op patients questions designed to detect awareness
9.	Consider EEG-based monitoring in high-risk cases.
<b>Table-3: Questionnaire</b>	

meetings, improving education of all anaesthetists.

Most clinical cases of awareness during general anesthesia are elicited using a post-anesthesia structured interview, which is sometimes repeated at intervals after surgery. For a variety of reasons, patients rarely report such experiences to their anesthetists without prompting, so it is critical that anesthetists habitually perform post-operative interviews that incorporate specific questions designed in order to elicit reports of awareness<sup>12</sup> (Table 1).

#### Strategies to prevent awareness during general anesthesia

Ghoneim<sup>7</sup> has suggested a number of preventive measures to help avoid intraoperative awareness. Table 2 includes many of Ghoneim's recommendations and a few others.

#### CONCLUSION

Though incidence of anesthesia awareness is rare, but even a single incidence can be really devastating for the patient. Anesthesia providers should educate themselves thoroughly about intraoperative awareness and pre-anesthetic evaluation should routinely include assessment of patients' risk for this problem. When intraoperative awareness is suspected, the responsible anesthesia providers, their departmental administrators, and quality assurance team members should activate a series of interventions aimed at defining the nature of the event and its causes, while minimizing its impact by providing supportive care to patient

#### REFERENCES

1. American Society of Anesthesiologists Task Force on Intraoperative Awareness – Practice advisory for intraoperative awareness and brain function monitoring: a report by the American Society of Anesthesiologists

Task Force on intraoperative awareness. *Anesthesiology*. 2006;104:847-864.

2. Tunstall ME. Detecting wakefulness during general anaesthesia for caesarean section. *Br Med J*. 1977;21:1321.
3. Preventing and managing the impact of anesthesia awareness. *Jt Comm Perspect*. 2004;24:10-1.
4. Khan MF, Samad K, Shamim F et al. Awareness during anesthesia update. *MEJ Anesth*. 2008;19:723-736.
5. Charles HM – Awareness during anesthesia. *Can J Anesth*. 1999;46:R80-R87.
6. Myles PS, Williams DL, Hendrata M et al. Patient satisfaction after anaesthesia and surgery: results of a prospective survey of 10,811 patients. *Br J Anaesth*. 2000;84:6-10.
7. Ghoneim MM, Block RI, Haffarnan M et al. – Awareness during anesthesia: risk factors, causes and sequelae: a review of reported cases in the literature. *Anesth Analg*. 2009;108:527-535.
8. Kate Leslie MD Dreaming during anaesthesia in adult patients, *Best Practice and Research Clinical Anaesthesiology*. 2007;21:403-414.
9. Claes Lenmarken MD, Psychological consequences of awareness and their treatment *Best Practice and Research Clinical Anaesthesiology*. 2007;21:357-367.
10. Editorial, Anesthesia awareness: an analysis of its incidence, the risk factors involved, and prevention. *Journal of Clinical Anesthesia*. 2006;18:483-485.
11. Osterman JE, Hopper J, Heran WJ, et al. Awareness under anesthesia and the development of posttraumatic stress disorder. *Gen Hosp Psychiatry*. 2001;23:198-204.
12. Brice DD, Hetherington RR, Utting JE: A simple study of awareness and dreaming during anaesthesia. *Br J Anaesth*. 1970;42:535-542.
13. Stuart A. Forman, MD, PhD Awareness during general anesthesia: concepts and Controversies *Seminars in Anesthesia, Perioperative Medicine and Pain*. 2006;25: 211-218.
14. Fonseca J. A textbook of oral and maxillofacial surgery. Vol:1.
15. Fonseca J. A textbook of oral and maxillofacial surgery. Vol:2.

**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 14-05-2017; **Accepted:** 17-06-2017; **Published:** 30-06-2017