

Intraoperative awareness with recall during General Anaesthesia in Damascus University Hospitals in Syria

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Abstract

Background: Awareness with recall during general anesthesia is one of the frightening complications of general anesthesia, which indicates the failure of anesthesia. Awareness is an underestimated complication despite the fact that it sometimes carries devastating psychological risks for patients. To our knowledge this is the first research in Syria that reports the incidence of awareness with recall during general anesthesia.

Aims: to assess the incidence of awareness with recall during general anesthesia in Damascus University teaching hospitals.

Design: Multi-central prospective cohort study.

Setting: Three main Teaching Hospitals of Damascus University: Al-Assad, Al-Mowassat & Maternity Hospitals during the time period between January and November 2021.

Study Sample: 3500 patients aged ≥ 18 years were included.

Results: the incidence of Awareness with recall during general anesthesia in Damascus University Teaching Hospitals was 0.66% in low risk of awareness surgery and 1.8% in high risk of awareness surgeries. The most frequent manifestations of awareness were auditory perceptions, paralysis and pain (100%, 100% & 97.4% respectively).

Conclusions: Awareness with recall rate was somehow high in Damascus University Teaching Hospitals in comparison to the figures reported by American and European studies, this difference was especially noted in a low risk of awareness surgery. The rates were similar in the high risk of awareness surgeries. Lack of premedication and low concentration of inhalational agent were the main reasons for awareness.

Keywords: anaesthesia; damascus university

Introduction

The main goals of general anesthesia are to achieve amnesia and unconsciousness during surgery, and by achieving these two goals it is rare for memory to be built during surgery; Surgery memory is one of the feared and underestimated complications of general anesthesia[1], which is defined as Accidental Awareness during General Anesthesia (AAGA), and more precisely, it is defined as Awareness during general anesthesia with Recall (AWR), Whether this experience is expressed spontaneously by the patient or after direct questions are asked to the patient since the presence of

awareness presupposes the activation of long-term explicit memory [2]. There is another type of awareness during anesthesia, which can have translated by transcending the explicit memory and presupposes the activation of the hidden memory, which is a type of memory that is said to exist, but we do not know that we have it, and that is often called implicit memory [3]. There are many phenomena of awakening during anesthesia that are not classified under the term awareness or explicit or implicit memory nor it is declared spontaneously by the patient, not even by

interrogation, but rather manifests clinically in the form of a sever change in behavior or performance [4]. According to Western statistics, the incidence of AWR ranges between 0.1-0.2%. In a multicenter American study, the rate of AWR was 0.13% [5], and 0.16% in a Sweden study [6], while another study in Ethiopia showed that the magnitude of AWR under general anesthesia was found to be 8.2% [7]. Although these rates seem low, only they indicate the failure of anesthesia. The psychological consequences are sometimes devastating, and are represented by fear and permanent aversion to anesthesia and surgery, through acute stress disorder, to the syndromes of post-traumatic stress disorders [8]. According to a forensic medical analysis, 2% of the lawsuits against anesthesia were related to complications resulting from awareness during general anesthesia [9]. The incidence of AWR can rise to 1-2% in patients with a high risk of awakening, and this includes: Patients undergoing cesarean section, cardiothoracic surgery, emergency surgery, major cancer surgery, patients with a difficult airway and those developing intraoperative hypotension [10].

The Modified Brice Interview questionnaire is the best model for diagnosing intraoperative awareness with explicit memory¹¹. AWR, if diagnosed, is also classified according to the Michigan Awareness Classification Instrument [12]. The rate of AWR during general anesthesia has not been studied in Syrian hospitals before; Therefore, we conducted a prospective descriptive cohort study to establish its incidence during routine general anesthetic practice in a number of University Hospitals in Damascus, and to

determine the risk factors for the occurrence of AWR during general anesthesia.

Methods

We conducted a prospective multi-center observational study at Damascus University Hospitals (Al-Assad University Hospital, Al-Mowassat University Hospital and Maternity University Hospital), for the period between January to November 2021. This study was approved by the Ethics Committee of Faculty of Medicine-Damascus University. Following signing the consent form, 3500 patients were included in the study.

Inclusion criteria: General anesthesia patients aged \geq 18 years who are able to communicate and give correct information.

Exclusion criteria: we excluded patients with psychological and mental disorders, patients with a high risk of death after surgery and required mechanical ventilation in intensive care units for more than 24 hours.

Our study subjects were interviewed after the anesthesia protocol and surgery; thus, the attending anesthesiologists were unaware of the study. None of the patients had bispectral index (BIS) neither EEG monitoring (because it was not available in hospitals at the time of the study); however, respiratory gas monitors were available in a few cases to measure end-tidal anesthetic concentration.

Basic patient demographic and treatment data (age, sex, ASA physical status, type of surgery, and anesthesia care details) were recorded on an Arabic-language standardized case report form (Appendix 0).

Research questionnaire Awakening during general anesthesia

File No: Gender: Age: 1 year, ASA

Surgery type:

Modified Brice Interview questionnaire

In the recovery room after a 24-hour follow-up for a week

What is the last thing you remember before anaesthesia?

What is the first thing you remember when you wake up?

Do you remember anything between the onset of anaesthesia and waking up?

Did you have any dreams during the surgery?

What was the worst thing you experienced about the surgery as a whole?

In the event of a diagnosis of awakening during anaesthesia, we complete the interrogation to determine the degree of awakening accordingly

Michigan Awareness classification Instrument:

- Grade 0: There is no clearing.
- Grade 1: isolated auditory perception.
- Grade 2: tactile perception (e.g., surgical manoeuvres or tracheal intubation).
- Grade 3: pain.
- Grade 4: paralysis (e.g., feeling unable to move, speak, or breathe).
- Grade 5: pain and paralysis.

And to each degree, the letter D (Distress) is added to indicate the patient who mentions his sense of fear, anxiety, a sense of doom, suffocation or a sense of imminent death.

Review the patient's record to record anaesthetics used for initiation and continuation, monitoring during anaesthesia.

AWR during surgery was investigated using the structured modified Brice interview questionnaire (Appendix 1) in two different times: one just before

discharge from the recovery room for all patients and second on the day after surgery just with cases in which possible awareness was detected.

Appendix 1: The structured modified Brice interview 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?

Furthermore, AWR was also classified according to the Michigan Awareness Classification Instrument (Appendix 2).

Appendix 2: Michigan Awareness Classification Instrument

Class 0: No awareness

Class 1: Isolated auditory perceptions

Class 2: Tactile perceptions (e.g., *surgical manipulation or endotracheal tube*)

Class 3: Pain

Class 4: Paralysis (e.g., *feeling one cannot move, speak, or breathe*)

Class 5: Paralysis AND pain

An additional designation of "D" for distress was also included for patient reports of fear, anxiety, suffocation, sense of doom, sense of impending death, etc.

Data analysis

The data has been entered and analyzed using IBM SPSS Statistics version 22. Descriptive statistics analysis was used to describe the sample, its characteristics and the occurrence of AWR. The software was also used to perform logistic regression models to examine the associations AWR with specific risk factors.

Results

Of 3571 patients, 71 were excluded because they did not meet the inclusion criteria while some were not able to be questioned after surgery or were mechanically

ventilated or died. The total number of patients was 3500, and they were interviewed in the recovery room by one of the study researchers.

Demographic Characteristics of patients:

Patients' age ranged between 18-80 years, of which 48% were between 18-40 years. Females' subjects accounted more than males (61.6% vs 38.4%). 58.7% of patients were ASA = 1 according to the American Society of Anaesthesiologists classification. Laparoscopic and abdominal surgery accounted for 15% of all cases, while emergency, cancer and cardiac surgery accounted less than 10%, and lower rates were seen of the other types of surgeries.

Table 1: summarize the characteristics of the included patients.

Patient characteristics		
	Number of patients	percentage
Age		
18 - 40 years	1282	36.6 %
41 - 60 years	1679	48.0 %
61- 80 years	539	15.4 %
Gender		
Male	1345	38.4 %
female	2155	61.6 %
ASA		
I	2055	58.7 %
II	1304	37.3 %
III	141	4.0 %
Surgery:		
Laparoscopic S	540	15.4 %
Abdominal S	529	15.1 %
Emergency S	426	12.2 %
Cancer S	373	10.7 %
Cardiac S	359	10.3 %
Neuro S	229	6.5 %
Urology	196	5.6 %
Orthopedic S	177	5.1 %
Gynecological S	175	5.0 %
Thoracic S	134	3.8 %
Neck S	131	3.7 %
Breast S	98	2.8 %
Vascular S	78	2.2 %
ENT S	24	0.7 %
Ophthalmic S	15	0.4 %
Bariatric S	14	0.4 %
Emergency Caesarean Section	2	0.1 %

Incidence of AWR: Thirty-nine patients reported awareness with recall of events that occurred between the induction of anesthesia and awakening (they answered yes to the questions of the modified Brice questionnaire, especially the third question), and those were investigated by another doctor the day after

surgery, and no patient mentioned that he had dreams during anesthesia. The total incidence of awareness with recall was approximately 1.1% in the study population.

Of 39 patients with AWR, all subjects (100%) reported the feeling of being paralyzed and the inability to move

or breath; 29 subjects (74.3%) did not receive premedication with Midazolam; and 11 subjects (28.2%) had low and insufficient concentrations of inhalational agent for maintenance of general anaesthesia.

Dividing the sample according to whether it's a AWR high risk or not, two subgroups were identified: * 1374 Patients with high risk of AWR (cardiac surgery,

emergency surgery, major cancer surgery, Bariatric surgery, cesarean section, patients with a difficult airway and those who developed intraoperative hypotension), of which 25 patients reported AWR (AWR's Incidence was 1.8 %), and * 2126 non AWR high risk patients, of which 14 subjects reported awareness with recall (AWR's Incidence was approximately 0.66 %).

Table 2: summarize the incidence of AWR in our study patients

Incidence of AWR			
	Number of patients	Awareness	Percentage %
All patients	3500	39	1.1
Patients with high risk of AWR	1374	25	1.8
Rest of the patients	2126	14	0.66

Awareness manifestations: By investigating the patients who reported awareness during general anesthesia, all patients did describe that they heard voices and conversations in the operating room, and also, they mentioned how they sensed surgical maneuvers, complete paralysis and inability to move. 38 patients suffered from severe pain during surgery and

only one patient did not feel pain. 25 patients evaluated awareness during anesthesia as a very bad, terrifying and unforgettable memory, while the patient who did not feel pain, evaluated the awareness to be less bad considering it in his own language as a "complication that may occur". Table (3) shows the percentages of awareness manifestations.

Table 3: Awareness manifestations

	Numbers of patient	percentage
Auditory perceptions	39	100
Unable to move or breathe	39	100
Pain	38	97.4
Sensation of endotracheal tube	14	35.9
Feeling surgery without pain	1	2.6
Anxiety/stress/fear	25	64.1

Discussion

The incidence rate of AWR during general anesthesia recorded globally ranges between 0.1-0.2% [13], and it can rise to reach 1-2% in patients with high risk of awareness [10].

This study showed a total incidence of 1.1% for AWR during general anaesthesia in all the studied hospitals. This rate differed significantly between the patients who were at high risk of awareness compared to the rest of patients (1.8% compared to 0.66% respectively). The recorded rate in high awareness risk patients was similar to that described in other countries [10], while higher for patients at low AWR risk than that described in USA and Australia (0.13% and 0.16% respectively) [5-6], and much less than that described in North of Ethiopia (8.2%) [7].

By reviewing the aesthetic drugs used for AWR patients, we found that only 10 patients received

premedication with Midazolam (the drug was not available in hospitals). In 11 subjects, the concentrations of inhalational agent for maintenance of general anaesthesia were low and insufficient, due to hypotension, a leak in the anesthesia circuit, or a lack of attention of the Anesthesia team. Due to the use of neuromuscular blocking agents in all patients, the incidence of feeling paralyzed and the inability to move or breath was 100%.

In order to determine the risk factors of AWR, the univariate and multivariate logistic regression results were showed in Table (4) and (5). Individual's gender showed no correlation to the incidence of awareness which is consistent with the results of the American study [5] and contradicts with a European study that reported female gender to be one of AWR risk factors [14]. Our data showed that there is no association between ASA classification and AWR, and this contradicts the results of the American study, which

found that the risk of awareness increases in patients with classification III and IV according to the ASA [5]. There was a correlation between AWR and both age and the type of surgery, most cases of awareness occurred at ages less than 41 years and this corresponds to the results of a review of reported cases [15] and contradicts the results of the American study [5]. And there was a strong correlation between the type of

surgery and the incidence of AWR where most cases of awareness occurred in emergency surgery, which is a similar finding to the reported figures reported in many studies [16-17-18-19]. Also, we found a correlation between lack of premedication and low concentration of inhalational agents with the incidence of AWR, and this is consistent with the results of several studies [16-17-19].

Table 4: Univariate logistic regression

Univariate logistic regression						
	B	E. S	Wald	ddl	Sig	Exp(B)
Gender	.529	.322	2.693	1	.101	1.697
ASA	-.617	.334	3.416	1	.065	.540
Age	-.859	.276	9.679	1	.002*	.423
Surgery	.108	.042	6.738	1	.009*	1.114
premedication	1.065	.367	8.429	1	.004*	2.900
Low inhalational agent concentration	-.934	.356	6.894	1	.009*	.393

Table 5: Multivariate logistic regression

Multivariate logistic regression						
	B	E. S	Wald	ddl	Sig	Exp(B)
Gender	.768	.327	5.511	1	0.19	2.155
ASA	-.307	.373	.674	1	0.412	.736
Age	-.852	.311	7.482	1	0.006*	.427
Surgery	.120	.40	9.014	1	0.03*	1.127

Limitation of the study

Due to difficulties in performing a post-hospital discharge follow-up for the study subjects, we were not able to study the psychological effects of awareness during anesthesia on patients.

Conclusion

Awareness with recall during general anesthesia in Damascus University hospital is relatively common and occurs in 11 patients out of every 1000 cases of general anesthesia, we recommended more attention by the anesthesia team on the possibility of awareness during general anesthesia by providing premedication and using sufficient concentration of inhalational agent.

Declarations

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Availability of data and materials

All data related to this paper's conclusion are available and stored by the authors. All data are available from the corresponding author at a reasonable request.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of faculty of medicine - Damascus university All Participants confirmed their written consent by signing the consent form. Participation in the study was voluntary and participants were assured that anyone who was not inclined to participate or decided to withdraw after giving consent would not be victimized. All information collected from this study was kept strictly confidential.

Consent for Publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All the authors participated in the preparation for this study and in data collection. NR was responsible for data analysis, literature search and write-up, and AK reviewed the final draft.

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