

RISK FACTORS AND INCIDENCE FOR INTRA OPERATIVE AWARENESS IN PATIENTS UNDERGOING CARDIAC SURGERY

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ABSTRACT

Objective: Is to analyze the incidence of intraoperative awareness in patients undergoing cardiac surgery in addition to evaluate possible contributing factors. **Patients and Methods:** This was an open cross sectional study conducted in Queen Alia Heart Institute between January 2010 to April 2010 on 498 patients consecutively underwent cardiac surgery during this period. Patients enrolled in the study were interviewed 2 – 3 days post surgery by specialized team consisted from anesthetist and surgeon who were involved in the surgery, every report about patients awareness was assessed thoroughly later on. **Results:** The incidence of awareness in patients underwent cardiac surgery was 6.2% (32 patients out of 498 experienced some sort of awareness). Most of the cases of awareness occurred during cardiopulmonary bypass, especially during rewarming, followed in frequency by the period of induction. It was found that length at surgery > 4 hr and total pump time > 90 minutes, low EF < 20% were strong significant risk factors for intraoperative awareness. **Conclusion:** The incidence of awareness is quite high during cardiac surgery in Jordan; therefore by identifying possible contributing factors, we can deal with this problem accordingly.

Keywords: Intraoperative awareness, cardiac anesthesia.

INTRODUCTION

Despite the tremendous improvements and great achievements in the field of anesthesia, we still face awareness as a serious complication with potentially terrifying psychological consequences.

The incidence of awareness in patients undergoing relaxant general anaesthesia is about 122 per, 1.000 [1, 2], but it is high in certain group of patients especially those undergoing cardiac surgery [3, 4, 5, 6], caesarean section under general anesthesia, [7] and major trauma surgery [8].

Cardiac anaesthesia is associated with higher incidence of awareness compared with other specialties with reported one ranging between 1.1 to 23% [4, 5, 6]. Probable reasons for this obvious significant increase might be related to the widely used high opioid based techniques, which reduce requirements of inhalational and intravenous anaesthetic agents [4, 5], in addition to almost unpredictable pharmacodynamics of anaesthetics under the extracorporeal circulation especially in the rewarming period and at time of cessation of bypass [4, 5, 6, 9], furthermore interpersonal and interracial differences in

drug reactions, hemodilutions, and binding on foreign surface areas are considered important contributing factors [4, 5], finally uncertainty about the return of mental status in patients at risk of neurological injury may make physicians reluctant to administer intravenous agents such as midazolam [9].

The reported incidence depends on the type of surgery, anesthetics used [4, 5, 10], the timing of and technique for evaluating awareness and recall [5, 10]. The consequences of intraoperative awareness is variable, on one hand, patient may experience bad events as dreams, night mares and anxiety, and on the other hand patient might develop post traumatic distress syndrome [5].

The aim of this study is to analyze the incidence of intraoperative awareness during cardiac surgery in addition to evaluate possible risk factors.

PATIENTS AND METHODS

This was an open cross sectional study to evaluate patient's recall of awareness during cardiac surgery which was conducted in Queen Alia Heart institute between January 2010 to April

2010 on 498 patients consecutively done during this period.

Inclusion criteria included general anaesthesia with tracheal intubation, age at least 18 years, no any evidence of psychiatric illness that might interfere with reliability of the interview. Regarding excluded patients, those included patients with serious morbidities post surgery, in addition to any neuropsychological insults following surgery.

Included patients were interviewed 2 – 3 days after surgery by specialized team consisted from anaesthetist and surgeon when were in the team who conducted the surgery for the patient. Cases with awareness were classified as one of three groups according to the probability of true recall group, definite cases required that recalled event was confirmed by attending personnel, group 2, probable cases, the interviewers were convinced that the memory was real, but no confirmation could be obtained; Group 3; possible cases who were unable to recall any event indicative of true awareness [6].

After awareness was diagnosed in certain cases, then the phase during which this event happened was identified according to specific classification as follows phase 1, after induction of anaesthesia and before splitting of the sternum.

Phase 2, during the splitting of sternum; phase 3, after splitting and before by pass grafting, phase 4, during by pass grafting or CPB; phases, after the end of by pass grafting or CPB and before the end of anaesthesia; phase 6, indefinite.

The anaesthesia protocol followed in the study group involved the usage of laxtonil tablets on the night of surgery as premedication in addition to an opioid and benzodiazepine before anaesthesia. Induction was performed with fentanyl and midazolam (dormecium) and etomidate, anaesthesia was maintained using isoflurane or propofol and fentanyl. During anaesthesia, muscular relaxation was usually maintained use pipecuronium.

Date were expressed as means \pm standard deviation (SD), Chi square was used to evaluate frequencies, an T test was used to asses independent factors. P value < 0.05 was considered to be statistically significant.

RESULTS

The incidence of intra operative awareness in our study was 6.4% as 32 patients out of 498 experienced some sort of awareness. 43.7% of patients (n = 14) had this even in phase 4, while 25% (n = 8) reported awareness in phase 1, in addition to that 15.6% (n = 5) and 9.37% (n = 3) experienced intraoperative awareness in phase 2, 3 respectively, on the other hand, mere 3.1% (n = 1) and 3.11% (n = 1) had awareness during phases and 6 respectively (Table 1).

Regarding patients characteristics, average age group 53.5 ± 6.9 years ranging between (41 – 72y) in the ptn's who experienced awareness, while it was 52.3 ± 4.2 years range (42 – 70y) in the ptn's who didn't have intraoperative awareness, it was found that this was statistically insignificant $P > 0.05$.

At the same time, we have 17 males, 15 females in the awareness group, in contrast to 24 males, 226 females in the ptn's who have no awareness with no statistic significance $P > 0.05$ (Table 2).

Other parameters like DM, HT. were studied, and found to be insignificant $P > 0.05$, however Low EF $< 20\%$ was found to be significant $P < 0.01$, with 10 patient out of 32 had EF $< 20\%$ in the awareness group, in contrast to 65 out of 466 in the group who didn't experience awareness had EF $< 20\%$ (table 2).

Concerning operative details, like TPT (total pump time) and duration of surgery, these were found to be significant contributing factors to the development to awareness. Firstly 13 patients out of 32 had TPT > 90 minutes in the awareness group in contrast to 70 patients out of 466 had TPT > 90 minutes in the other group, $P < 0.001$, secondly 12 patients out of 32 patients who had awareness had duration

of operation > 4 hrs, while 69 patients out of 466 had duration of operation > 4 hrs, $P < 0.001$ (Table 2).

Discussion:

The incidence of awareness during cardiac surgery is quite variable ranging as previously mentioned between 1.1 – 23%, which includes the incidence found in our study 6.2%, however other studies reported incidence ranging from 1.1% to 1.5% during cardiac surgery [11,12], moreover Dowd et al [13] did a prospective study on incidence of awareness in cardiac anaesthesia and reported incidence of 0.3% in fast track cardiac anaesthesia which might be explained by the use of balanced anesthetic technique involving continuous administration of volatile (Isoflurane) or intravenous (propofol) anaesthetic agents before, during, and after cardio pulmonary bypass [4].

Further more Kaplan [14] reported that intraoperative awareness occurs only in 1% of patients, whereas other authors report an incidence of up to 28% [5].

The reported incidence has some correlation with the type of anaesthesia, strength of stimuli, timing and persistence to elicit recall which is seen through the differences in the incidence reported with the interviews being held at different times post surgery [5].

In our study, most of the patients experienced auditory events in form of talks heard by the patient during the surgery, none of the patients had visual or painful perceptions. The mental reactions by the patient toward these events were not very serious as none of our patients had psychological difficulties resulting from the awareness.

Concerning the timing of awareness during surgery, we found that 14 patients had this in phase 4 which correlates with the unpredictable pharmacodynamics of anaesthesia under the extracorporeal circulation with significant decrease in the levels of the drugs that help in preventing awareness moreover a study

by Tempe DK and his colleagues [15] reported that most cases with awareness occurred during or after rewarmed from CPB, in addition to that it was found the longer the total pump time, the more likely awareness will develop ($P < 0.001$).

Further more, 8 patients had awareness in phase 1 which might be explained by the fact in certain high risk patients, hemodynamic instability limits the administration of volatile anaesthetics which correlated with our finding that $LOW\ EF < 20\%$ was considered significant contributing factor ($P < 0.001$) in addition to that this might be due to the fact that many anaesthetists ignored the problem of awareness because they were busy with catheterization of the central veins during this phase [6].

At the same time, 5 and 3 patients experienced awareness in phase 2 and 3 respectively, while just one patient had awareness in phase 5 and 6. In the case of phase 2 awareness, this might be attributed to the intense stimuli and relative under dose of anaesthetics.

Regarding possible risk factors we found no significant contribution of age or sex or medical diseases like DM, HT to the development of awareness. However we found $EF < 20\%$ and longer total pump time as well as duration of operation > 4 hrs, to be statistically strong significant contributing factors $P < 0.001$.

Finally, the recent usage of Bispectral monitors of depth of anaesthesia like BIS (bispectral index), may help in reducing the incidence of awareness by warning of inadequate anaesthetic levels, and redirecting the anaesthetists to avoid inadvertent anaesthetic under administration (9)

CONCLUSION

The incidence of awareness is quite high during cardiac surgery in Jordan; therefore by identifying possible contributing factors, we can deal with this problem accordingly.

Table (1)

Phase	Number of patients	Percentnge
1	8	25%
2	5	15.6%
3	3	9.37%
4	14	43.75
5	1	3.1%
6	1	3.1%

Table 2

Patient Characteristics

	Patient with awareness(32)	Patient with out awareness(466)	P Value
Age	53.5 ± 6.9 years	52.3 ± 4.3years	p> 0.05
Male	17	240	p> 0.05
Female	15	226	p> 0.05
DM	17	276	P > 0.05
HT	18	296	P >0.05
EF < 20	10	65	P < 0.01

Table 3

Intraoperative details

	Patients with awareness(32)	Patients without awareness(466)	Pvalue
Total > 90minutes pump time	13	70	P < 0.001
Duration of surgery > 4 hrs	12	69	P < 0.001

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Risk Factors And Incidence For Intra Operative Awareness In Patient-----

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