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Research Article

Immediate Respiratory Complications after Tracheal Extubation at the End of Elective Surgeries in an Academic Based Hospital in Iran: A Preliminary Survey

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ABSTRACT

Background: Postoperative complications and patient safety are of great importance to every anesthesiologist. These complications are even more important when related to the respiratory or cardiovascular system. The present study aimed to evaluate the frequency of major and minor respiratory complications that occur after tracheal extubation in an academic-based hospital in Iran.

Methods: In this preliminary prospective survey, the incidence of immediate major and minor complications associated with tracheal extubation after elective surgery in an academic-based hospital affiliated with Tehran University of Medical Sciences with anesthesiology residents was studied.

All patients undergoing intubation in the operating room of Shariati Hospital, during the elective lists from Saturdays to Wednesdays, during two months were enrolled. Emergency patients and patients who had any complication during their intubation such as difficulty in intubation or more than two tries for tracheal intubation and patients who were transferred from the operating rooms to the intensive care unit were not included in the study. Patients with BMI over 35 were also not included in the study. During tracheal extubation and up to recovery, all respiratory adverse events including coughing and bucking, Spo2<%90, difficult mask ventilation, apnea/hypoventilation, vomiting, laryngospasm, and aspiration were recorded. The time of the day at which complications occurred was also recorded.

Results: Three hundred and seventeen patients were randomly studied. 171 (53.9%) patients were male and 146 (46.0%) of the studied patients were female. Overall, 184 number (58.0%) of all the patients experienced either coughing or bucking on extubation. 29 (9.1%) patients experienced apnea and/or hypoventilation, out of which 8 (2.5%) of them developed laryngospasm which was more frequent in the male population.

Conclusion: In this preliminary survey, it was observed that 59.6% of all the patients experienced at least one of the minor or major respiratory complications of tracheal tube extubation at the end of surgery which was more frequent in women compared to men.

General anesthesia may be accompanied with some well-known complications which every anesthesiologist should be aware of that could be benign or catastrophic. Postoperative respiratory complications are the result of various interacting factors related to patients physical status, type of surgery and

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intraoperative events [1]. It has been reported that perioperative pulmonary complications may occur in one-third of non-cardiothoracic surgical patients with American society of anesthesiologists physical status 3, despite protective ventilation [2].

Many scoring systems have been proposed to quantify these risks and predict perioperative pulmonary complications but there is no consensus on which one to use, and most of them are too complicated to be used at the bedside [3]. A variety of respiratory complications may occur during the tracheal extubating period such as coughing/bucking, aspiration, laryngospasm, apnea/hypoventilation. Prevalence of complications vary depending on the definitions used and the populations studied. With regard to timing, respiratory complications that can be directly associated to general anesthesia may be classified as complications that occur during induction of anesthesia and tracheal intubation such as bronchospasm; during anesthesia such as tracheal tube displacement; and during the tracheal extubation period and in the early postoperative period. It should also be noted that serious hemodynamic complications may also occur during the same periods of times. Complications attributable to hemodynamic changes can vary from some benign arrhythmias and insignificant changes in blood pressure to cardiac arrest.

Same as complications related to hemodynamic changes which may vary, complications attributable to respiratory systems may be benign or fatal.

In this study, we aimed to investigate the incidence of respiratory complications that occur immediately after tracheal extubation after elective surgery in an academic-based hospital.

Methods

Following approval of the Ethics Committee of Tehran University of Medical Sciences, with the record number of 1396/2681, data collection of the patients who met the inclusion criteria was started.

We conducted a preliminary prospective survey to determine the incidence of immediate major and minor respiratory complications associated with tracheal extubation after elective surgery in an academic-based hospital affiliated with Tehran University of Medical Sciences with anesthesiology residents, where obstetric surgery, orthopedic surgery, general surgery and urology surgery are performed. We also intended to record the actions performed by residents to relieve these complications.

All patients undergoing intubation in the operating room of Shariati Hospital, during the elective lists from Saturdays to Wednesdays, during a three months period were enrolled and emergency patients, patients with anticipated difficult airway, patients who had any respiratory complication during induction of anesthesia such as difficulty in intubation or more than two tries for tracheal intubation and patients who were transferred directly from the operating room to the intensive care unit were not included in the study. Patients with BMI over 35 were also not included in the study.

Based on previous experience of the attending, a formal data-recording form was developed. The anesthesiology residents were asked to fill in the sections.

The data form included at least a tick in one box; including a "none" box. This helped us to detect errors of omission and commission. Age, gender, type of operation and length of surgery, patient weight and type of tracheal tube were also recorded in the sheets.

During and immediately after tracheal extubation and up to the recovery room, all respiratory events that occurred, including coughing and bucking, Spo2 <%90, difficult mask ventilation, apnea/hypoventilation, vomiting, laryngospasm, and aspiration were recorded.

After the operation patients were transferred to the recovery room while oxygen was supplied through a facemask; in the recovery room, their condition was monitored by recovery nurses, and anesthesiology residents decided when to discharge patients to the ward.

The data are presented as mean and SD and the frequency of the complications are presented as percentage. The relative risk and 95% confidence limits for different risk factors were not reported at this stage of this preliminary survey.

Results

Three hundred and seventeen patients were randomly studied. 171 (53.9%) patients were male and 146 (46.0%) patients were female. Overall, 184 number (58.0%) of all the patients experienced either coughing or bucking on extubation which is classified as a minor complication. 29 patients experienced apnea and/or hypoventilation, out of which 8 of them developed laryngospasm which was more frequent in the male population. The basic characteristic of the patients studied and the frequency of the surgeries are presented in (Table 1).

Table 1- Basic Characteristics of the patients studied and the frequency of surgeries studied.

	Mean±SD	Frequency of surgeries studied
Age	41.1±3	
Weight(Kg)	77±7.8	
Duration of Anesthesia (min)	123.5±9.6	
ASA(I/II)	129/188	
Obstetrics surgery		84/26.4%
Orthopedics surgery		69/21.7%
General surgery		117/36.9%
Urologic Surgery		47/14.8

The overall incidence of complications are presented in (Table 2) and complications in relation to timing are presented in (Table 3). Five patients (1.5%) were reintubated and 3 (0.9%) patients needed reversal agents to be re-administered. Oral airway was used in 171 (53.9%) of the patients.

Table 2- Ranked incidence of the complication in relation to sex and timing of occurrence

Complication	Sex	Overall Frequency(n,%)
Coughing / Bucking	m→ 90 (%48.9)	
	f → 94 (%51)	184, (58.0%)
SPO2 <%90	m → 30 (%63.8)	
	f → 17 (%36.1)	47, (%14.8)
Difficult Mask Ventilation	m → 20 (%46.6)	
	f → 22 (%52.3)	42, (%13.2)
Apnea/Hypoventilation	m → 7 (%24.1)	
	f → 22 (%75.8)	29, (%9.1)
Vomiting	m → 2 (%25)	
	f → 6 (%75)	8, (%2.5)
Laryngospasm	m → 6 (%75)	
	f → 2 (%25)	8, (%2.5)
Aspiration	m → 1 (%33.3)	
	f → 2 (%66.6)	3, (%0.9)

Table 3- Complications in relation to timing

Complications / Times	Coughing/ Bucking	SPO2< %90	Difficult Mask Ventilation	Apnea/ Hypoventilation	Vomiting	Laryngospasm	Aspiration
8-10 am	40(12.6%)	12(3.7 %)	10(3.1%)	17(5.3%)	2(0.6%)	2(0.6%)	0(0.0%)
10-12 am	46(14.5%)	14(4.4 %)	12(3.7%)	3(0.9%)	3(0.9%)	4(1.2%)	3(0.9%)
12-2 pm	98(30.9%)	21(6.6 %)	20(6.3%)	9(2.8%)	3(0.9%)	2(0.6%)	0(0.0%)

Discussion

In this study it was observed that 59.6% of all the patients experienced at least one of the minor or major respiratory complications of tracheal tube extubation at the end of surgery which was more frequent in women compared to men. The most common complication observed after tracheal extubation was coughing. Although coughing is a physiologic response and may not be looked at as a complication by many anesthesiologists but the fact that it could be the root cause of other more severe complications such as laryngospasm, or affect the surgical outcome in surgeries such as thyroidectomy or surgeries on the brain by increasing intracranial pressure, make it an important side effect that should be studied and looked at more closely and attempts to prevent it should be initiated before tracheal tube extubation is attempted. In this study, it was observed that as the severity of complications increased, the incidence decreased, such that laryngospasm and aspiration had the lowest frequencies.

With regard to timing, most of the minor complications occurred during the last two hours of the studied period, which was just before the time of changing personnel and near the handover times but there was no timing dominancy observed with regard to more major complications such as laryngospasm or aspiration.

Anesthesiology is recognized as the leading medical specialty in patient safety [4]. One of the accountable reasons for this is that anesthesia can be hazardous and unsafe on its own without any prominent therapeutic effects, therefore anesthesiologists focus their attentions

on patients safety and are unwilling to make unnecessary risks.

The incidence of an airway problems depends on the definition used and the timing in the postoperative that the complications are being studied. Respiratory complications that occur within 48–72 h following surgery vary considerably with the immediate postoperative complications.

And obviously the frequency of respiratory complications in the recovery room is different to the complications observed immediately after tracheal extubation.

Several factors may influence the incidence of respiratory complications associated with tracheal intubation or extubation.

In previous studies different rates of respiratory complications have been reported because different definitions of respiratory complications have been used and the population of patients studied has varied.

In a study conducted over two decades ago by Asai, even when all incidents of coughing that occurred after tracheal extubation were disregarded as a complication, the overall incidence of respiratory complications after tracheal extubation was 7.4%, which was higher than the complications observed during tracheal intubation [5] and various techniques such as changing from tracheal tube to laryngeal mask airway before extubation have been proposed to decrease these complications [6]. There has been little discussion regarding the complications that occur during extubation in the literature in comparison to discussions that focus on problems associated with tracheal intubation. Many guidelines have been proposed for the management of intubation in anticipated and unanticipated difficult airway managements [7-10] and most anesthesiologists make sure that they stick strictly to these guidelines to prevent any complications. Although there are some guidelines for tracheal extubation of patients but management of tracheal extubation is usually overlooked and less attention is payed to complications associated to tracheal extubation. For example, Fould et al proposed a practical approach to trachea extubation but they focused mostly on difficult airways [11].

It should be noted that the present survey was conducted in an academic based hospital where anesthesiology resident with different expertise are practicing, and one of the limitations and differences of the present study with similar studies was the fact that the we did not study the effect of the expertise of anesthesiology residents on the occurrence of complications. Although the mentioned variable was not studied in the present study, the fact that teaching anesthesiology residents how to extubate patients in an academic based hospital may affect the incidence of complications observed cannot be ignored. A possible solution to increasing patient safety in such circumstances may be using simulation techniques. Unfortunately, again, simulations techniques used frequently mostly focus on patients tracheal intubation management or weaning patients in the critical care setting [12-14]. The need for patient simulations focusing on tracheal tube extubation in academic based hospitals is imminent.

Another shortcoming of the present study was that we did not study pediatric patients or respiratory complications in patients with anticipated or unanticipated difficult airway or patients who experienced difficulties during tracheal intubation after induction of anesthesia. It is obvious that such patients who have experienced difficulties during intubation period may also experience difficulties during extubation, with higher incidence.

In future studies we also recommend studying patients undergoing regional anesthesia which may experience various minor and major respiratory complications in the perioperative period.

Anesthesia is much safer now days compared to a couple of decades before. However there is always a place for improvement. We believe that focusing on the established anesthetic techniques and promoting patient safety may be more useful to patients than pursuing new ones.

The present study was a preliminary survey on the complications that occurred immediately after tracheal extubation in an academic based hospital in Iran. It was observed that 59.6% of all the patients experienced a respiratory complications of tracheal tube extubation at the end of surgery. This survey will be the start of a much more comprehensive study which will focus on various variables associated with complications that occur after tracheal tube extubation in a much larger population of patients.

Conclusion

Our study showed good correlation between DES/EMVC ratio and Cormack-Lehane grade in which increasing DSE and the mentioned ration are associated with increased risk of difficult intubation. Therefore sonographic measurement criteria may be helpful in airway evaluations before anesthesia for predicting of difficult intubation.

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