

**COMPARISON OF AIRWAY COMPLICATIONS AFTER ENDOTRACHEAL TUBE EXTUBATION IN BOTH SUCTION OF SECRETIONS AND THROAT PACKING WITH GAUZE SWABS SOAKED IN NORMAL SALINE IN CHILDREN 3 MONTHS TO 6 YEARS**

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**ABSTRACT**

The physiologic and anatomic difference of respiratory airway makes children susceptible for airway problems rather than adults. These problems may be intensified followed by suctioning the mouth and throat. So, this study was performed to compare the respiratory complications of two methods of packing the mouth and throat with gauze swabs soaked in normal saline immediately after Endotracheal intubation and suctioning method of secretion before extubation of endotracheal tube and choosing a suitable method. This study was a randomized clinical trial which was performed on 201 children (101 in packing group and 100 patients in suctioning of the mouth and throat group). All patients with the same technique and drug were intubated with the equal dose and by the one anesthesiologist. Complications after removal of the endotracheal tube in deep anesthesia were recorded in separate forms for each patient. By data analysis and using logistic regression, chi-square was done in software spss version 16. Among 201 participant children, 85% were male. Distribution of demographic variables was similar in both groups. These two groups had statistical significant difference with each other only in terms of the amount of secretion after surgery  $0.001 < p$  after extubation although wet gauze swabs pack had better condition, the differences between these two groups was not significant in other studied complications. Using a wet gauze swabs pack can reduce oral secretions and consequently reduce the need for endotracheal suctioning, so regarding the complications of suctioning of mouth and throat in children, using this method is recommended in all surgeries of children.

**KEY WORDS:** Comparison, airway complications, endotracheal

**INTRODUCTION**

Despite of medical advances and surgical techniques, complications of general anesthesia inevitably occur and breathing and airway problems, especially during the postoperative period (recovery) are the most important complications (Miller and Miller's, 2010). Airway problems in children occur more frequently than adults (Miller *et al.*, 2009) which are specifically due to physiological and anatomical differences with adult's respiratory system. Common problems in children's airway occur during and after extubation include: Airway edema which is caused by inflammation of the respiratory airway mucosa (due to selecting of over size or cuffed endotracheal tube - the presence of viral or bacterial infections and unwanted suctioning mucus), broncho laryngospasm which occurs in following of the irritation of airway with extrinsic factor such as endotracheal tubes, throat secretions, using airway devices and intrinsic factors; like pain (incidence of 4-8%). Other complications are such cough (is a reflex to remove the things or secretions from the respiratory system (incidence 15-30%), breath holding. which is stop breathing when the patient's airway is normal (incidence 3%), Wheezing which is the presence of any abnormal sound during breathing and decrease of arterial oxygen ( SPO<sub>2</sub> ) (Incidence 11- 22%). These problems are common occurred after extubation at the end of general anesthesia (Salengros *et al.*, 2011).

Routinely before extubation of endotracheal tube, the mouth and throat secretions are suctioned by Nelaton catheter, and sometime suction of trachea and bronchi are necessary when these have secretion (Glass and Grap, 1995). Suctioning itself cause the irritation of mucus and removal of Oxygen from respiratory tract. Experts believe that in the case that suction is not performed in standard form and correctly it will cause some complications such as infection of cardiac arrhythmias, decrease of blood's oxygen, damage to the mucosa, increase of carbon dioxide pressure, increase of intracranial pressure, atelectasis, or even death. Anesthetics and fitting of any means at the mouth like an endotracheal tube cause the increase of mouth's secretion that the removal of secretions before extubation is essential to prevent aspiration. In some cases, Suction of the mouth and throat cause to trauma and edema of the mucosa of the

pharynx and epiglottis and uvula particularly if the negative pressure of suction is not controlled. From one hand, suction of oropharynx does not remove the secretions around the vocal cords completely and throat and its remaining causes laryngospasm (Rudra and Chatterjee, 2006).

The presence of secretion throat even less than 1 cc causes the intensification of protective larynx reflexes and airway and respiratory events that follows it. Thus, eliminating the whole secretion is necessary before extubation (Davis *et al.*, 2010). A study by Elhakim *et al* with the aim of reduction of postoperative sore throat by packing impregnated with Tenoxicam on 80 patients under septum surgery showed that 4 patients in the intervention group suffered from sore throat, but in control group which normal extubation are carried out, 16 people suffered from sore throat which the difference between two groups was significant (Elhakim *et al.*, 2000). The study of Tay *et al* was performed with the aim of airway packing effect on reduction of the incidence of postoperative sore throat, the results showed that two groups were not significantly different in terms of sore throat and the presence of pharyngeal pack has no effect on (Tay *et al.*, 2002). In the absence of study similar to the present study, airway complication vulnerability in children and by assuming the occurrence and intensification of problems in the follow of mouth and throat suction, the method was selected based on its prevention in which the airway complications after extubation of endotracheal tube were compared in two methods of secretion suction and packing (mouth) with gauze swabs soaked in normal saline immediately after intubation at the beginning of the general anesthesia in children 3 months to 6 years.

## MATERIALS AND METHODS

This study as experimental clinical one was performed on children from 3 months to 6 years who were under the surgery of elective herniorrhaphy, Orchidopexy and Hypospadias (These surgeries does not interact and affect the respiratory airway) in Taleghani hospital in 2012. Individuals were selected in a simple way and were divided into two groups in a simple random way; the intervention arrangement began after obtaining the approval of the Ethics Committee of Anesthesiology Department of Golestan Medical Sciences University.

The criteria for entrance to the study included: obtaining oral and written content of 3 month to 6 year patients' parents and ASA class I & II. The criteria for exit of study included: having a history of cold in the past 4 recent weeks, any history of asthma and respiratory allergies, sleep apnea syndrome, abnormal ventilation by mask at the beginning of anesthesia (with the possibility of an airway problem), having steroids history (the possible effect in reducing the incidence of edema), lasted laryngoscopy and difficult intubation, over size endotracheal intubation, induction by the inhaled anesthetic (the possible effect in airway excitability), long surgery and patient 's straining before bucking extubation. The two studied groups included: the first group with the method of secretions suction before extubation and the second group were those with the method of packing of mouth and throat with gauze swabs soaked in normal saline after intubation at the beginning of anesthesia. All patients admitted on the day of surgery and had not received any premedication). Both groups were put under general anesthesia by one medical protocol. Anesthesia induction were performed by 1 g  $\mu$ /kg fentanyl then 5 mg / kg sodium thiopental and 0.6 m g / kg atracurium and after three minutes the patient intubated with a tube without cuff by the anesthesiologist in less than 15 seconds and then after checking its correct location it was fixed with tape . In the second group, after fixing the tube (depending on the age and size of the oral cavity), one, half or one third of the gauze swabs soaked in normal saline (Squeezed gauze swabs) was placed in the oral cavity with a laryngoscope and Magill forceps. Continuing of anesthesia with isoflurane, 50% N<sub>2</sub>O and 50% oxygen was established. At the end of surgery, atropine 0.2 mg / kg and neostigmine 0.4 mg / kg was used to reverse atracurium effects and endotracheal tube was removed during deep anesthesia in both groups. After discontinue of inhaled anesthetic and N<sub>2</sub>O immediately, mouth and throat secretions were suctioned in the first group with a suction device model Dominant 50 and the negative pressure suction 300mmgh then the endotracheal tube was removed. In the second group, endotracheal tube was removed after bringing out of gauze and without suctioning. After waking up, patients were transferred to the recovery room as well as spo<sub>2</sub> monitoring and oxygen therapy with mask were performed under the observation of recovery nurse and anesthetist supervision. Data's of each patient including age, sex, duration of surgery, and complications such as oral secretions volume, breath holding, laryngospasm, coughing and irritation of the airway, need to re-suction, spo<sub>2</sub>, wheezing, requiring re-intubation and respiratory function assessment were adjusted in the check list, which were entered in the form. All patients before transfer of the unit, receive Acetaminophen suppository as control of postoperative pain according to their weight and transferred to ward after confirming of anesthesiologist. Respiratory status and the need to re-intubation were studied in the first hour in unit and were recorded in a separate form for each patient. SPSS version 21 was used for data entry

and data analysis. Regarding the binary nature of the dependent variable (has, does not have), the odds ratio were obtained by logistic regression and chi-square test was used to calculate the relation between two qualitative relationship.

**RESULTS**

The findings of this study indicate that in each group, 85% of patient were male and 15% were female. 46 (23%) patients were in age of 2-12 months, 82 (41%) patients in age of 12-36 months, and 72 (36%) patients were aged over 36 months. There has not been observed a significant difference between demographic characteristics and duration of surgery in two groups of study.

**Table 1) demographic variables in two groups of packing with wet gauze swabs and suction group**

Variable	Classification	Pack Group n (%)	Suction Group n (%)	P value
Age	2-12	23 (22.8)	23 (23.0)	0.67
	12-36	44 (43.6)	38 (38.0)	
	36 <	34 (33.7)	39 (39.0)	
Gender	The girl	16 (15.8)	15 (15.0)	0.86
	The boy	85 (84.2)	85 (85.0)	
Duration of Surgery	30	30 (29.7)	20 (0.20)	0.24
	30-60	64 (63.4)	70 (0.70)	
	60 <	7 (6.9)	10 (10.0)	

**Table 2) Absolute frequency and percentage of complication in separation of locating in suction group and do packing**

Variables	Classification	Suction group (%)	Packing group (%)	P value
secretion volume	No secretion	27	76	0.000
	Low secretion	54	17	
	Too secretion	19	7	
wheezing	Yes	9	7	0.588
	No	91	93	
breath holding	Yes	16	11	0.288
	No	84	89	
cough	Yes	20	12	0.116
	No	80	88	
Laryngospasms	Yes	5	7	0.564
	No	95	93	
Spo <sub>2</sub> level	More than 90%	81	85	0.433
	Less than 90%	19	15	

Chi-square test showed that there is a significant difference between two methods of suction and packing in terms secretion volume (P <0.000). In a manner that 76% participants were in the packing group without oropharyngeal secretions and the suction rate was 27% for the group. In terms of other complications, there has not been observed any significant relationship between the two groups (Table 2).

**Table 3: The risk of complications incidence in the suction group compared to packing group**

Variables	Classification	The odds ratio	Confidence interval
secretion volume	No secretion	1	-
	Low secretion	8.33	4.17 to 16.64
	Too secretion	7.54	2.85 to 19.92
wheezing	does not have	1	-
	has	1.31	0.47 to 3.67
breath holding	does not have	1	-
	has	1.54	0.68 to 3.51
cough and sore throat	does not have	1	-
	has	1.83	0.84 to 3.98
Laryngospasms	does not have	1	-
	has	0.69	0:21 to 2:28
Spo <sub>2</sub> Drop	Less than 90%	1	-
	More than 90%	1.33	0.63 to 2.79

The table above shows that volume of secretion in suction group was significantly higher than packing group (odds ratio: 7.54 and confidence interval 19.92 -2.8 5). (Table 3)

**Table 4: Relation between child's age and incidence of airway complications in general anesthesia.**

Variables	Classification	Less than one year	More than one year	P value
secretion volume	No secretion	22 (47.8)	81 (52.3)	0.82
	Low secretion	17 (37)	55 (35.5)	
	Too secretion	7 (15.2)	19 (12.3)	
wheezing	Yes	5 (10.9)	11 (7.1)	0.37
	No	41 (89.1)	144 (92.9)	
breath holding	Yes	16 (34.8)	11 (7.1)	0.001
	No	30 (65.2)	144 (92.9)	
cough	Yes	8 (17.4)	24 (15.5)	0.81
	No	38 (82.6)	131 (84.5)	
Laryngospasms	Yes	8 (17.4)	4 (2.6)	0.001
	No	38 (82.6)	151 (97.4)	
Spo <sub>2</sub> level	More than 90%	28 (60.9)	16 (10.3)	0.001
	Less than 90%	18 (39.1)	139 (89.7)	

Chi-square test showed that there is a significant relation between incidence of airway complications including breath holding, laryngospasm, spo<sub>2</sub> drop and the age of the child. (Table 4)

Chi-square test did not show a significant relation between the duration of surgery and complications of airway.

## DISCUSSION

According to the results, it was observed that the secretion volume and the numbers of time requiring the suction in packing group with wet gauze swabs reduced significantly in comparison with suction group. Major differences between children's airway and adults make intubation and extubation more difficult in this age group and create dangerous complications in children than in adults, which requires particular attention of anesthesiologists in order to reduce early and late complications (BURGESS *et al.*, 1980). It seems that using pharyngeal pack in children can be helpful in reducing the severity of the complications. Based on the findings of the two groups, occurrence frequency of wheezing, breath holding, coughing, laryngospasm, the drop in Artery oxygen saturation, need for re-intubation did not

have a significant statistical difference in two groups, but it was seen that all checked complications except laryngospasm in packing group by wet gauze swabs was less than suction group and in the term of checked complications, the packing group by wet gauze swabs had better conditions and although two groups had significant difference in terms of volume secretion, it can be said that this difference in the reduction of secretions and consequently the reduction of demand to suction can prevent many serious complications of suction surgery like atelectasis, bronchospasm, pneumonia (Jongerden *et al.*, 2007), spo2 reduction, Dysrhythmia (Demir and Dramali, 2005) and artery hypoxemia (Piacentini *et al.*, 2004) and the following complications.

Specially, the reason of secretion decrease in packing method is due to absorbance of secretion by packing gauze swabs so this will cause the reduction of numbers of time requiring the suction in the same group. Using the pharyngeal pack in nasal, oral and throat surgery prevent aspiration of blood and secretion (Adewale, 2012). In performed studies of airway complication, sore throat symptoms has repeatedly been investigated, but the evaluation of the postoperative sore throat does not have sufficient accuracy due to the age of patients in the present study. Although Downes' Croup Score are repeated used in assessment of sore throat in Croup (Airway infections) but its use in condition of post-Anesthesia does not have sufficient attention (Diaz *et al.*, 1986). In a study conducted by Tay et al that investigated the throat packing effect on the incidence of postoperative sore throat, the results showed that, the presence of pharyngeal pack was accompanied with the increased incidence of postoperative sore throat (Tay *et al.*, 2002). Piltcher study showed the presence of pharyngeal pack does not reduce nausea and vomiting in surgery of the nose (Piltcher *et al.*, 2007).

The results of Basha et al study showed that application of pharyngeal pack did not have an effect on reduction of nausea, vomiting and aspiration after surgery and it is accompanied with the increase of sore throat after nose surgery and 93% of people using pharyngeal pack will experience sore throat at 2 and 6 hours after surgery (Basha *et al.*, 2006). In Karbasfrushan study; the presence of pharyngeal pack did not have an effect in reducing nausea and vomiting and it caused the intensification of sore throat after nose surgery (Karbasfrushan *et al.*, 2014). In Kloub study, using the pharyngeal throat had no effect in creation of sore throat (Kloub, 2001). Elhakim et al study result showed sore throat decreased with significant difference after packing with gauze swabs soaked in Tenoxicam (Elhakim *et al.*, 2002).

Fennessy and colleagues studied postoperative nausea, vomiting, and sore throat in three groups by using dry and wet gauze swabs without using pharyngeal packing which at end no significant difference was observed in incidence and complication reduction in three group of study (Fennessy *et al.*, 2011). In the present study, there were significant difference between the ages of above one year and below one year and the surgery complication such as laryngospasm, SPO2 drop and breath holding and above one- year- group has less complications rather than below one- year- group, and there has not been observed a significant difference between two groups in complications such as amount of secretion, wheezing and coughing.

No significant difference has been also seen between the duration of surgery and airway complications incidence in both groups, it seems at the time of the above study, the duration of performed surgeries was close to each other in two groups, in a way that this duration did not create a significant difference in the incidence of complications. In this meta-analysis Gordon duration of surgery and anesthesia were not the predictive factors of mortality and death in patients (Gordon and Koch, 2006).

## CONCLUSION

Although there has not been found a study similar to this the current one till there is a chance to compare them, regarding the achieved results it seems that pharyngeal secretion reduction and suction demand reduction after using pharyngeal packing will cause the reduction of suction complications because children show different reactions from themselves such as breathe holding, laryngospasm, coughing and irritation of the airway and finally their Spo<sub>2</sub> drop in response to the suction complication especially edema of the uvula which could be a threat to them. Moreover, the reduction of the demand to suction prepares the patient quickly for removal of endotracheal extubation and reduce the possible transmitted infection by suction of secretions because in most cases it has been seen that the suctioning is not performed in correct way and in principle and this interferes in increasing the risks result from it especially in patients

with low ages, as well as the economic cost of packing with wet gauze swabs has a noticeable reduction in comparison with suction for both patients and medical centers.

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