Endotracheal Intubation in Children Undergoing Cleft Lip Surgery.A Comparative Study Between Propofol and Halothane

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ABSTRACT:

BACKGROUND:

Endotracheal intubation is one of important step during the administration of general anesthesia. It is more so in pediatric patients with associated deformities like cleft lip and palate. Propofol, with its profound depressant effect on the airway reflexes, has a quick and smoother induction. Similarly, halothane is least expensive volatile anesthetic, sweaty to inhale and because of its safety profile.

OBJECTIVE:

The intubating conditions with the use of intravenous propofol is superior to inhalational halothane with oxygen for tracheal intubation without muscle relaxants in children who undergo cleft lip surgery.

PATIENTS AND METHODS:

In this prospective randomized study, 50 ASA I patients who where aged three to nine months, who were scheduled for cleft lips surgeries were included. Both group received halothane 3% by face mask with monitors attached [pulse oximeter , ECG ,NIBP]. I.V line inserted ,first group(propofol group) once patients become sleepy &respiration became regular& stop movement they received 2mg/kg propofol &E.T.T attempt within 0ne min.2nd group inhalational(halothane Group) until pupil been central & constricted &E.T.T attempted within 5 min. The intubation conditions were assessed by using Steyn's modification of the Helbo - Hansen intubating conditions score.

RESULTS:

The intubating conditions were better in group A than in group B. The group A patients (88%) significantly had more clinically acceptable intubating conditions than in group B(52%), (p=0.0015) .

CONCLUSION:

The intubating conditions with the use of intravenous propofol 2mg/kg is superior to inhalational 3% halothane with oxygen for tracheal intubation without muscle relaxants in children who undergo cleft lip surgery.

KEY WORDS: halothane , propofol, tracheal intubation, cleft lip, paediatric anaesthe.

INTRODUCTION:

Endotracheal intubation is the one of important steps during the administration of general anesthesia. It is more so in pediatric patients, especially, if there are associated deformities in and around the airway, like cleft lip and palate.

Insufflations of the trachea for the purpose of ether anesthesia was introduced in 1909 in USA and in 1912 in UK [(1)]. Later, tracheal intubation became a part of the anesthesia practice. It was usually performed under deep inhalation anesthesia with ether. The same technique was continued with halothane and of late sevoflurane is gaining attention, especially in the pediatric anesthesia practice.

Neuromuscular blocking agents which aid tracheal intubation were first introduced into the clinical practice in 1942 in USA [(1)] .The neuromuscular blocking agents have made technique of endotracheal intubation much easier, but not without the risks of subjecting the patient to potential risks. Until early 1990, suxamethonium was the only drug which was used for facilitating tracheal intubation due to its rapid onset and ultra short duration of action, but it has many potential side effects like myalgia, bradycardia, elevated intraocular and intracranial pressures, hyperkalaemia, prolonged apnoea, masseter spasm and malignant hyperthermia [(2,3,4)] .

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Most of the cardiac arrests were attributed to hyperkalaemia in patients with undiagnosed muscular dystrophies which were triggered after the use of suxamethonium [5]. studied tracheal intubation without neuromuscular blockade in 50 healthy children who where aged 3-9months, who underwent repair cleft deformities ,randomized study, in which the children were chosen to either the propofol group or the halothane group and they concluded that intubation by using propofol without neuromuscular blockade was feasible and safe in a majority of the children.

Non-depolarizing, neuromuscular blocking agents are alternative, but are slower in onset and they have a prolonged neuromuscular blocked [3] . And also an inability to reverse the paralysis quickly if airway management via mask or tracheal intubation is not possible [2-6]. The excessive or unnecessary neuromuscular blockade contributes to awareness under general anesthesia, residual paralysis and sometimes even allergic reactions [7].

The possibility of intubating the trachea without muscle relaxants has been under evaluation .The drug which is the most favorable one for this purpose is propofol, due to its profound depressant effect on the airway reflexes[8] . It decreases the pharyngeal and laryngeal activities and the muscle tone [9]. Induction with propofol is quick and smooth, with rapid awakening and orientation during recovery [10].

On the other hand, of all the inhalational agents which are available, halothane are halogenated alkane the carbon-fluoride bonds are responsible for its nonflammable and non explosive nature. Halothane is the least expensive volatile anesthetic, and because of its safety frofile. Conducted a study which concluded that for pediatric patients [11-20] ,the halothane and sevoflurane provided similar intubating conditions, but that the higher success rate with sevoflurane was advantageous because it produced less myocardial depression and propensity to increase the heart rate. Sigston PE, Jenkins AMC andJackson EA et al [14]. concluded that induction and tracheal intubation by using propofol was satisfactory alternative to halothane 3% for 5 min in children. Study with inhalational heart rate and Blood Pressure decreased after the induction and they increase after the intubation .Blair et al's [15].

PATIENTS AND METHODS:

This prospective, randomized study conducted at Martyr Gazi Al- hariry hospital for surgical specialities in medical city. An informed written consent was obtained from the parents. We studied 50 children who were aged three to nine months,(all the patients were class of the American society of anesthesia(ASA I) who presented for cleft lip, who required tracheal intubation). Children who had a history of upper respiratory tract infection in the previous 3 weeks or who were known to be allergic to any of the study drugs, or in whom a difficult intubation was anticipated, were not included in this study. A majority of the children were accompanied to the anaesthetic room by one of the parents.

Procedure

On their arrival to the anaesthetic room, a standard, non-invasive monitoring was established. The pre-operative baseline values of the heart rate, blood pressure and oxygen saturation were recorded and an infusion of crystalloid lactated ringer's solution was started according to the "4-2-1" formula (based on the body weight and the hours of fasting). The patients were randomly chosen by using an envelope method into 2 groups: - Group A (Propofol) and Group B (Halothane).Both group received halothane 3 % by face mask with monitors attached {pulse oximeter , ECG, NIBP } . The Group A patients received 2 mg /kg of propofol the the ET intubation was ttempted within one min.

The Group B patients received 3% Halothane via a face mask which was connected to the Mapelson F breathing circuit after priming the circuit with 3% Halothane after the loss of the eyelash reflex, IPPV was commenced. Tracheal intubation was attempted in all the patients at 5 min. and it was performed by using appropriate sized, oral RAE tubes. The intubating conditions were assessed by using the Steyn's modification of the Helbo Hansen intubating condition scoring system.The intubating conditions were considered to be adequate only when the scores were < 2 in all the categories and they were considered to be unacceptable if the score was >2 even in a single category. An additional bolus of l mg/kg of propofol was given if laryngoscopy was not possible due to coughing or excessive movement. In those patients in whom intubation was impossible even after two attempts due to any cause, suxamethonium lmg/kg was injected and the intubation was completed. The heart rate, blood pressures and oxygen saturation were monitored continuously and they were recorded as baseline, after propofol / Halothane induction.. Any stimulus including surgical stimuli was avoided for 10 minutes after the tracheal

intubation. Statistical analysis was performed by using the Student's unpaired t-test to analyze the time which was taken for the intubation, the number of attempts for the intubation and the hemodynamic parameters between the two groups and the Chi-square test was used to analyze the intubating conditions between the two groups. P-values of less than 0.05 were regarded as significant.

Observations

The intubating conditions were graded by using a scoring system which was devised by Steyn's modification of Helbo–Hansen. The ease of laryngoscopy, the vocal cord position, coughing, jaw relaxation and limb movements were allocated a score of 1±4, as has been detailed in [Table/Fig1]. The intubating conditions were considered to be unacceptable if any category scored greater than 2. So that significant differences in ventilation between the groups would be detected.

Table 2-1: Steyn Modification of Helbo – Hansen Intubating Condition.

Laryngoscopy	Easy	Fair	Difficult	Impossible
Vocal Cords	Open	Moving	Closing	Closed
Coughing	None	Slight	Moderate	Sever
Jaw Relaxation	Complete	Slight	Stiff	Rigid
Limb Movements	None	Slight	Moderate	Sever

Statistical analysis

All statistical analysis was done by using Statistical package for Social Sciences (SPSS) version 19. The data were statistically analyzed depending on the nature of the character.

- Categorical data were presented as Count and percentage. Chi-square test of significance was used.
- Quantitative data were presented as mean and standard deviation of mean, independent sample t-test used for comparison between each two groups.
- The lowest level of significance chosen to be when the probability (p) was less than or equal to 0.05 ($p \leq 0.05$).

RESULTS:

The statistical analysis of age, weight and sex distribution was done by using the Student's unpaired-t test. A p-value of more than 0.05 was regarded as not significant. Both the groups were found to be statistically similar with respect to age, weight and sex distribution.

Table 3-1: Distribution of age, weight &sex.

parameter	Group A (n=25)	Group B (n=25)	P-value
Age (month)	5.86±2.34	6.04±3.21	0.856^{NS}
Weight(kg)	7.6±1.67	7.78±1.54	0.785^{NS}
Sex(m/f)	16/9	18/7	0.544^{NS}

NS not significant (p>0.05).

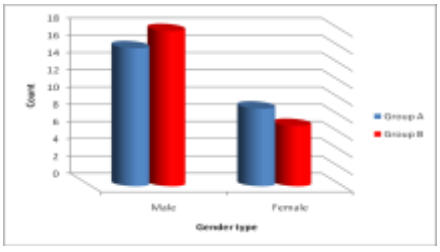

Fig 3-1: Gender type distribution between study groups.

The duration of the intubation was not similar in the groups A and B. The p-value of 0.001 was highly significant (Table 3-2).

Table 3-2: Average duration of intubation.

Duration (seconds)	Study groups	
	Inhalation	Propofol
Mean	244.29	46.67
Maximum	300.00	60.00
Minimum	180.00	30.00
Median	240.00	50.00
Range	120.00	30.00
Standard Error	13.29	2.52
Standard Deviation	49.72	9.76
P value	0.001	

The intubating conditions were clinically acceptable in 88% of the patients in groupA as compared to 52% in group B, which is highly significant (p-value=0.0015)

Table 3-3: Over all intubating conditions P-value=0.0015.

Group	Clinically acceptable	Clinically unacceptable
A	22	3
B	13	12

(16 %) Children in group A required 2 or 3 attempts for the intubation as compared to (35 %) in group B (Table 3-4).

Table 3-4: Number of attempts for intubation.

Group	Parameters	Number of Attempts for intubation			
		1	2	3	Total
A	Count	21	3	1	25
	% of total	84%	12%	4%	100%
	% within group	57%	30%	33%	50%
B	Count	16	7	2	25
	% of total	64%	28%	8%	100%
	% within group	43%	70%	67%	50%

Chi-sequare=[2.609] P.value =[0.270]

The complications of both group like branchospasm was significantly lower in group A than in group B (p=0.047) and the Apnea was highly significant difference between them (p= 0.001).

Table 3--5: Complication of both groups.

Parameters	Group A (n=25)	Group B (n=25)	p-value
Branchospasm	3(12%)	9(36%)	0.047*
Apnea	25(100%)	10(40%)	0.001**

* Significant difference (p≤0.05).
** Highly significant difference (p≤0.001).

(Table 3-6) Inter group comparison of steyn modification of Helbo – Hansen intubating condition scoring system there was no significant difference in the assessment of laryngoscopy and jaw relaxation (p=0.312) between propofol and Halothane.

There was significant difference in the assessment of vocal cords (p=0.026) and lime movement (p=0.035) between propofol and halothane.

There was highly significant difference in the assessment of coughing (p=0.001) between propofol and Halothane (table 3-6).

Table 3-6: Inter group comparison of Steyn modification of Helbo-Hansen intubating condition scoring system.

parameters	Group A	Group B	P value
Laryngoscopy			
Easy	25(100%)	24(96%)	0.312^{NS}
Difficult	0(0%)	1 (4%)	
Vocal cords			
Open	23(92%)	15(60%)	0.026*
Moving	2(8%)	8(32%)	
Closing	0(0%)	2(8%)	
Coughing			
None	20(80%)	6(24%)	0.001**
Slight	2(8%)	4(16%)	
Moderate	3(12%)	6(24%)	
Severe	0(0%)	9(36%)	
Jaw relaxation			
Complete	25(100%)	24(96%)	0.312^{NS}
Stiff	0(0%)	1(4%)	
Limb movements			
None	20(80%)	10(40%)	0.035*
Slight	3(12%)	8(32%)	
Moderate	2(8%)	6(24%)	
Severe(jerky)	0(0%)	1(4%)	

NS not significant (p>0.05)
Not significant (p>0.05)
* Significant difference (p≤0.05)
** Highly significant difference (p≤0.001)

DISCUSSION:

The introduction of propofol and Halothane in the clinical practice has led researchers to ignore neuromuscular blocking agents for tracheal intubation. In this study, Propofol offered successful intubating conditions in 100% of the patients within 60 seconds while Halothane provided successful intubating conditions in 80% of the patients within 360 seconds. No cough experience ratio was higher in propofol receiving patients than Halothane receiving patients. Propofol offered better intubating conditions than Halothane and shortened the anesthesia induction period. Propofol is suggested to be the agent of choice for intubation without muscle relaxants because of its significant myorelaxant properties on pharyngeal and laryngeal structures[(2)].

Coghlan et al [9] compared propofol with or without alfentanil in healthy adult patients and found that propofol (2.5mg/kg) alone caused a significant increase in the HR and the MAP after the intubation. The addition of alfentanil (20/ micg/kg) produced a slight increase in the MAP and no change in the HR.

From the above studies, it has been found that propofol definitely causes reduction in the HR and blood pressure following induction and that it attenuates the haemodynamic responses to laryngoscopy and intubation. The decrease in the HR and the blood pressure in our study were due to the synergistic effects of fentanyl and propofol. Fentanyl blunted the haemodynamic response to laryngoscopy and intubation, whereas propofol decreased the sympathetic nervous activity.

In group B, tracheal intubation was accomplished only 52% of those children had acceptable intubating conditions as compared to 88% in group A, which was highly significant. In group B Laryngoscopy was easy in 96% of the children. The vocal cords were open in 60% , 24% of the children had no cough, Jaw relaxation was complete in 96% of the children . Limb movements were absent in 40% of the children.

In Thwaites et al [11] study, all the children could successfully be intubated with 8% sevoflurane in nitrous oxide and oxygen at 150s. 91% of the children demonstrated that 8% sevoflurane with nitrous oxide in oxygen could provide acceptable intubating conditions at 150s. Blair et al [15] found that 87.5% of the children had acceptable intubating conditions, after administering 8% sevoflurane in 60% nitrous oxide in oxygen. The intubation was attempted at 180mins. Among these, 45% of the children had excellent intubating conditions. The results of this study were similar to those of our study. Laryngoscopy, vocal cord position, coughing, jaw relaxation and limb movements were significantly better in the propofol group than in the 8% sevoflurane or 3% Halothane group.

Parmod Kumar Bithal et al [13]found that the time to reach the clinical end point for the intubation was 325.93 ± 44.02s. Acceptable intubating conditions were achieved in 81.25% of the patients. One patient had moderate coughing. The jaw relaxation was complete in all the patients. None had limb movements. There was no significant difference in the assessment of laryngoscopy and vocal cords between halothane and sevoflurane.

CONCLUSION:

The intubating conditions with the use of intravenous propofol + Halothane combination is superior to inhalational 3% halothane with oxygen for tracheal intubation without muscle relaxants in children who undergo cleft lip surgery.

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