

TRACHEAL INTUBATION WITHOUT NEUROMUSCULAR BLOCK IN CHILDREN

Tahira Hakeem Shah

*Department of Anaesthesia,
Khyber Teaching Hospital,
Peshawar.*

ABSTRACT

Objective: The object of this study was whether the intubating conditions and the haemodynamic responses to intubation and laryngoscopy without neuromuscular block were better as compared to that, following suxamethonium.

Material and Methods: A prospective study was conducted on patients who were undergoing Adeno Tosillectomy. This study was performed Khyber Teaching Hospital, Peshawar over a period of one year (1995 to 1996). 100 patients of both sexes were selected which were undergoing adenotonsillectomy.

Their ages were between 8 to 12 years. The patients with potentially difficult intubation and those who were sensitive to the drugs used were excluded from the study. Patients were divided in two groups of 50 patients each. In group-A induction was done with propofol and suxamethonium and in group-B induction was achieved with propofol and fentanyl.

Results: After collecting and comparing the data in both the groups the result showed no statistically significant difference in the two groups except limb movements and coughing. In group A (suxamethonium) 99% cases had acceptable intubation and Laryngoscopy while the conditions were unacceptable in 1% cases. There was a slight cough in 10% cases and slight limb movements in 15% cases while in group B (fentanyl) 87% cases had acceptable intubation and Laryngoscopy while 13% had unacceptable intubating condition. Severe cough was present in 5% cases while moderate limb movements were present in 20% cases. As far as haemodynamic variables were concerned heart rate and MAP shooted. High in group A (Table) while in group B there was slight decrease in both the variables. (Table)

Conclusion: Intubation with fentanyl and propofol has the advantage of less haemodynamic changes and attenuation of physiological responses to endotracheal intubation. Side effects of suxamethonium are also avoided. These studies need further evaluation concerning the doses of different agents and their proper timing. It is hoped that in future that we might get rid of the bad aspects of the drugs used in group B (fentanyl-propofol) like coughing, limb movements, high cost and non-availability of the product in market.

Key words: Tracheal Intubation. Neuromuscular block. Suxamethonium. Fentanyl. Propofol.

INTRODUCTION

The major responsibility of the anaesthesiologist is the provision of adequate respiration and ventilation. A patent airway is vital for it. Tracheal intubation is one of the important techniques during general anaesthesia to secure patent airway. In children particularly a sound and safe intubation is essential as their respiratory reserve is low and can easily become hypoxic.

Succinylcholine continues to be used to facilitate tracheal intubation in paediatric practice but may produce adverse effects. The pharmacokinetics and pharmacodynamic properties of fentanyl shows that it may be a suitable agent for tracheal intubation. Recently the combination of fentanyl or alfentanil with propofol has been used successfully for tracheal intubation for children and adults³. This study compares "Tracheal intubation facilitated by suxamethonium versus fentanyl after induction of anaesthesia with propofol. The purpose of study was.

1. To study the haemodynamic response of Laryngoscopy and intubation with suxamethonium and fentanyl with propofol.
2. To study difference in intubating conditions between group A and group B.

MATERIAL AND METHODS

100 patients of A.S.A.¹ (American Society of Anaesthesiologist) were selected with age group between 8 to 10 years and the surgery performed was Adeno Tonsillectomy. Those patients with potentially difficult intubation and those sensitive to the drugs used were excluded from the study. Patients were divided into two groups as follows.

Initial non-invasive measurements were made of heart rate (HR), Oxyhaemoglobin saturation (SpO₂) and mean arterial pressure. Patients were not premedicated so that the actual response of the drugs used in the procedure could be studied. Lignocaine 0.2 mg per kg body weight was added to propofol to abolish the pain on injection. Patients were preoxygenated with 100% for 3 to 5 minutes.

Group A: patients were induced by means of propofol 3mg/kg body weight bolus over a period of 30 second⁴ followed by suxamethonium chloride 1.5mg/kg body weight. After the muscle fasciculation produced by suxamethonium were over, patients were intubated with a proper size cuffed orotracheal tube by a single senior anaesthesiologist who was unaware of the drugs used in the study. A straight blade

**SCORING SYSTEM FOR ASSESSMENT OF QUALITY OF INTUBATION, DEvised BY
HELBO-HENSEN-RAULO AND TRAP ANDERSON**

	1	2	3	4
Laryngoscopy	Easy	Fair	Difficult	Impossible
Vocal Cords	Open	Moving	Closing	Closed
Coughing	None	Slight	Moderate	Severe
Jaw Relaxation	Complete	Slight	Stiff	Rigid
Limb Movements	None	Slight	Moderate	Severe

TABLE - 1

paediatric Laryngoscope (Oxford) was used for Laryngoscopy. Maintenance of the anaesthesia was accomplished by oxygen +N₂O and halothane (0.5%). A paediatric circuit Arye's-T piece with Jackson Reese modification was used in the surgical procedure.

Group B: In this group patients were induced and intubated with the help of propofol 3mg/kg B.W. in 30 second followed by fentanyl 5mg/kg B.W. Intubation was similarly performed as group A after 45 seconds⁴

Following observations were made.

a. HAEMODYNAMIC MONITORING:

- Pulse oximetry by BCI international.
- Heart Rate recorded by means of 103 N/RS. (Sphygmomanometer).
- Mean Arterial Pressure by 103 N/RS. (Sphygmomanometer).

Observations were made at 5 different time intervals as follows.

1. Before induction (B)
2. After induction (A)
3. After intubation (AT)
4. 1 minute after intubation.
5. 3 minutes after intubation.

b. ASSESSMENT OF QUALITY OF INTUBATION.

This assessment was done according to the scoring system devised by Helbo Hansen Raulo, OTrap Anderson² (1988). According to this system intubating conditions are acceptable or not on the basis of the following scoring system. (Table No.1).

Ease of Laryngoscopy, Vocal Cord position, Coughing, Jaw relaxation, and Limb movements.

Each of above is allocated a score of 1 to 4. If a patient secured a score of 2 or less his condition for Laryngoscopy and Endotracheal intubation was acceptable but if the score was more than 2, it was taken as unacceptable.

RESULTS

Comparison was done between the following two groups.

Group A: Propofol and Succinylcholine.

Group B: Propofol and Fentanyl-.

PRE-OPERATIVE VARIABLES

No statistically significant differences were observed between the two groups in respect of base line haemodynamic variables i-e. heart rate and mean arterial pressure. (Table No. 3)

COMPARISON OF VARIABLE DURING AND AFTER INTUBATION. VALUES ARE EXPRESSED AS MEAN AND SD (STANDARD DEVIATION).

			B	A	AT	1 minute	3 minute
Heart Rate Per minute	Propofol & Suxamethonium	Group A	Mean=110 SD=0.9034	Mean=130 SD=1.277	Mean=140 SD=1.5649	Mean=130 SD=1.5649	Mean=120 SD=1.5649
	Propofol & Fentanyl	Group B	Mean=110 SD=0.934	Mean=104 SD=1.277	Mean=100 SD=3.194	Mean=105 SD=0.6388	Mean=95 SD=0.6388
Mean Blood Pressure mm of Hg	Propofol & Suxamethonium	Group A	Mean=108 SD=1.5649	Mean=100 SD=1.277	Mean=110 SD=1.277	Mean=100 SD=1.5649	Mean=90 SD=1.277
	Propofol & Fentanyl	Group B	Mean=108 SD=1.277	Mean=95 SD=1.277	Mean=90 SD=1.5690	Mean=100 SD=1.277	Mean=90 SD=1.277
Peripheral arterial O ₂ Saturation percentage	Propofol & Suxamethonium	Group A	Mean=97 SD=.845	Mean=96 SD=.640	Mean=98 SD=.580	Mean=98.4 SD=.580	Mean=98 SD=.716
	Propofol & Fentanyl	Group B	Mean=97 SD=.638	Mean=96.5 SD=.640	Mean=98.5 SD=.720	Mean=98 SD=.730	Mean=98.5 SD=.903

LEGEND

B: Before induction

A: After induction

AT: After intubation

1-min & 3-min:

1 minute and 3 minutes after intubation

TABLE - 2

COMPARISON OF VARIABLES AFTER INDUCTION AND INTUBATION:

• **Intubating conditions:**

In one hundred patients the intubation was successful without the need of further intervention. The overall assessments of intubating conditions were acceptable. In the suxamethonium group (A) 99% cases had acceptable intubation and laryngoscopy while the conditions were unacceptable in 1% cases.

In the fentanyl group (B), 87% cases had acceptable conditions for laryngoscopy and intubation while 13% had unacceptable laryngoscopy and intubation. There were no statistically significant differences between the two groups for laryngoscopy or vocal cord position.

Relaxation of jaw was complete in suxamethonium group. Coughing was present in 7% of all the cases but percentage was higher in fentanyl than suxamethonium group viz 5% in fentanyl group as compared to 2% in suxamethonium. 20% of the fentanyl group had moderate limb movements while slight limb movements were present in 15% of the cases of suxamethonium group.

There were no statistically significant differences between the two groups for laryngoscopy and vocal cord position. However coughing and limb movements were more in fentanyl group.

• **Heart rate:**

Heart rate was recorded at 5 different time intervals. The suxamethonium group

displayed a mark increase in heart rate from the base line after induction and intubation. In the fifth recording (3 min. after intubation), it came down but didn't reach the base line.

In fentanyl group heart rate remained virtually unchanged throughout (Table No. 2). Comparing the two groups, no statistically significant difference was observed in the heart rate before induction. However, significant differences were seen in the reading after intubation.

• Mean arterial pressure (map) (table no.2)

MAP was almost similar in both the groups initially. In group-A (suxamethonium), there was decrease of MAP (7.4%) from base line after induction and increased (1.9%) after tracheal intubation and it came down at 1 minute (7.4%) and at 3 minutes interval (16%). While in group-B (fentanyl), MAP decreased after induction. The decrease of MAP was 12%, 16%, 18% and 25% at A, AT, 1 minute and 3 minute respectively.

Comparing the two groups, no statistically significant difference was observed in MAP. However, a significant difference was seen, 1 & 3 minutes after intubation in both the groups. Coughing or the presences of limb movements were not associated with any corresponding haemodynamic response.

BASELINE HAEMODYNAMIC DATA VALUES EXPRESSED AS MEAN (S.D.)

	GROUP A:	GROUP B:
Heart Rate (Beats/Minute)	110 S.D+/-0.9034	110 S.D+/-0.9034
Mean Arterial Blood Pressure (mm of Hg)	108 S.D+/-1.5649	108 S.D+/-1.277

TABLE - 3

• Oxy-haemoglobin saturation (table no. 2).

Basic values were similar in both the groups. Recordings were done in 5 points. No significant change was found in different points in both the groups.

Statistical analysis

All values given in the result were as mean and standard deviation. Intubating conditions were given in mean as well as percentage. Numerical data was compared using analysis of variance. A p-value <.001 was taken as clinically significant.

DISCUSSION

Tracheal intubation without the use of neuromuscular blocking drugs is a technique, which has been studied widely and practiced following the work of McKeating, Bali and Dundee, which showed that conditions for laryngoscopy were superior after induction of anaesthesia with propofol rather than thiopentone. More recent studies in adults have attempted to improve the conditions further by the addition of adjunct agents as lignocaine, fentanyl and alfentanil⁵ (M.P. Steyn, 1994), (Davidson-JA, 1993).

No doubt suxamethonium is an excellent and short acting muscle relaxant. But it has many adverse effects like; increase salivation, cardiac dysrhythmias, elevated intraocular and intracranial pressure, hyperkalaemia and prolonged apnoea. Of particular importance in children is masseter muscle spasm and malignant hyper pyrexia⁶ (Leary-NP 1990). Although non-depolarising muscle relaxant can be used in place of suxamethonium but have slow onset and prolonged action which may not be required in short procedures and especially in rapid sequence intubation.

Apnoea and suppression of cough produced by fentanyl could prove beneficial

for tracheal intubation. Moreover, the presser responses to tracheal intubation were mostly attenuated by fentanyl. The dose of fentanyl used in the study was 5µg/kg body weight. It was found that by increasing the induction dose further, intubating conditions became acceptable in the conditions in which it was unacceptable.

Fentanyl was one of suitable opioids used in this study as its short duration of action facilitated prompt recovery from anaesthesia although the duration of apnoea after intubation was not the subject of this study, all the patients were breathing spontaneously before the completion of surgery and tracheal extubation was not delayed because of apnoea.

Muscle rigidity⁷ is side effect of fentanyl and is dose related but it was not observed during the study. Nausea and vomiting are the side effects of all the opioids but was not encountered during the study. However this can be safely prevented by antiemetic.

Induction agent i.e. Propofol was used in the dose of 3mg/kg body weight. This decreased laryngeal and pharyngeal reactivity and also muscle tone facilitated tracheal intubation.

In the past studies propofol has been used alone as well as along with fentanyl and alfentanil for intubation⁵. In one study it was found that in children propofol, 3 to 5 mg/kg B.W. alone proved unsatisfactory and less reliable. Increasing either depth of anaesthesia by incremental doses of propofol or giving opioids or lignocaine can improve the intubating conditions.

In this study no sedative premedication was given to observe the actual response of drugs. In the past work by Patel and colleagues suggested that sedative pre medication results in a lower induction dose of propofol⁸. Combination of propofol and fentanyl

also protect against the potentially adverse effects of tracheal intubation like systemic, intracranial and intraocular hypertension and tachycardia^{9,10}. Limb movements and coughing at the time of intubation and laryngoscopy although more common with propofol and fentanyl but were not associated with any haemodynamic changes. The same findings were found in another study in the past¹¹.

Lignocaine in the dose of 0.2mg/kg body weight was mixed with propofol to avoid pain on injection¹. Lignocaine has been used in many studies in the past as adjuvant. It also attenuates the intraocular pressure response to rapid tracheal intubation in children⁹. It has also been shown to attenuate the pressure and heart rate responses to laryngoscopy and tracheal intubation but timing of administration and doses are important⁹. In addition Lignocaine has dose related antitussive effect that is important in improving the intubating score as introduced by Helbo-Hensen Raulo O, Trap-Andersons².

CONCLUSION

Propofol-fentanyl combination was found to be a feasible induction agent alternative to propofol-succinylcholine in terms of haemodynamic stability and acceptable conditions for endotracheal intubation. The presser response to laryngoscopy and intubation was also attenuated with propofol-fentanyl combination. Refinement of this technique by the adjustment of the dose of fentanyl and propofol may minimize the incidence of coughing and limb movements and might improve the intubating conditions further.

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Address for Correspondence:

Dr. Tahira Hakeem Shah,
Assistant Professor,
Department of Anesthesia,
Khyber Teaching Hospital,
Peshawar - Pakistan.