Inhalational Anaesthesia Versus Total Intravenous Anaesthesia During a Rigid Bronchoscopy in Paediatrics

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ABSTRACT:

BACKGROUND :

General anaesthesia is routinely used for rigid bronchoscopy in paediatrics for different causes. Both methods of anaesthesia were used inhalational and total intravenous anaesthesia (TIVA).

OBJECTIVE:

Is to compare inhalational anaesthesia with total intravenous anaesthesia (TIVA) for rigid bronchoscopy in paediatric age group in regard to the heart rate, oxygen saturation, coughing, bucking, laryngeal spasm and bronchospasm.

PATIENT AND METHOD:

Thirty patients aged 2-6 years were chosen, divided randomly in two groups. In group I (inhalational anaesthesia) consisted of 15 patients and the anaesthesia was maintained with halothane while in group II use (total intravenous anaesthesia) TIVA was consist of 15 patients and anaesthesia was inducd and maintained with remifentanyl and propofol. The heart rate, oxygen saturation, coughing, laryngeal spasm and bronchospasm were evaluated during and after the procedure.

RESULT:

Blood oxygenation and Heart rate were more stable in group II (P=0.045 and P=0.024 respectively). There were slightly less cough and bucking in group II as compare with group I.

CONCLUSION:

TIVA is a good choice of anaesthesia during rigid bronchoscopy because of a good and stable level of blood oxygenation and heart rate. Coughing, bucking, laryngeal spasm and bronchospasm were less in TIVA group compare with inhalational group.

KEYWORD: bronchoscopy , inhalational anaesthesia, total intravenous anaesthesia, heart rate, oxygen saturation.

INTRODUCTION:

Anaesthetic management for removal of foreign body is still a challenge. Sharing the airway between the surgeon and anaesthetist poses difficulty in ventilation [1].

The rigid bronchoscope is used for foreign body removal from bronchial trees as therapeutic procedure or diagnostic procedure as taking a biopsy or bronchial wash. But foreign body removal still the most common indication of rigid bronchoscopy in paediatrics [2].

The anaesthesia for rigid bronchoscopy should be under principle that include rapid induction, lose of upper airway reflexes, the least hemodynamic instability, adequate maxillary and glottis relaxation, safe and rapid reverse and minimal postoperative complication.

The methods that are used for anaesthesia include IV sedation and use of muscle relaxant and maintenance by inhaling agent [3], induction and maintainance by inhalational agent with preservation of spontaneous breathing [4] , induction and maintaining by IV drugs with controlled or spontaneous breathing [3] and pure intravenous method with a jet ventilation[5].

When there is a complete airway obstruction due to foreign body impaction , it's better to use inhalational anaesthesia with a spontaneous breathing to perform a rigid bronchoscopy , which is traditionally used to facilitate airway endoscope in children [6].

Sever tracheal injury may occur because of bucking in a rigid bronchoscope so it's better to use muscle relaxant for adequate relaxation and a controlled ventilation [7]. Inhalational agent specially halothan can causes high chance of arrhythmia [6].

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The TIVA is preferred because of a less inhalation of anaestheting agent and a less environmental pollution [6].

PATIENTS AND METHODS:

A prorospective study done at al-jirahat hospital (Gazi AL-Hariri)-Medical City teaching hospital during the period from 1st of April 2013 to the 1st of April 2014. Thirty patient aged (2-6) years , ASA class I,II (American society of anaesthesia) were included, excluding severely distress child present with sever hypoxemia disturb consciousness because of sever air way obstruction.

They divided into two groups, inhalational anaesthesia group I (n=15) and TIVA group II (n=15).

Standard monitoring of vital sign included blood oxygen saturation by pulse oxymetry, ECG for heart rate and any arrhythmia was made and non-invasive blood pressure was measureed. All patients receive glycopyrrolate (0.01*mg/kg*) IV then preoxygenation was done for all patients for 3 minutes. In group I induction of anaesthesia was done by a propofol (*2 mg/kg*) and suxamethonium (1 *mg/kg*) then anaesthesia was maintained by halothane (1%) after insertion of a bronchoscopy.

In a group II patients receive propofol (2 *mg/kg*) and suxamethonium (1 *mg/kg*) then anaesthesia was maintained by remifentanyl (0.1mcg*/kg/min)* and propofol (50 *mcg/kg/min*) after insertion of bronchoscope. Suxamethonium dose repeated if needed.

Heart rates and arterial oxygen saturation were measured before and after induction and also at 5, 10, 20, 30 minutes interval after start of bronchoscopy and also in recovery room.

Any complication were noticed as coughing, bucking, bronchospasm, laryngospasm, pneumothorax, bradycardia and cyanosis also surgeon satisfaction .

The data was analyzed by chi-square, fisher exact test and student T –test. P value less than 0. 05 considered significant.

RESULT:

There were no significante differences in age, weight and gender distribution between both groups as shown in table 1.

Table 1 : Details of patient information and data.

Variable	Inhalation Anesthesia	Totally intravenous Anesthesia	p value
Age(y)	2.7±2.1	2.9±1.3	0.77
Weight(kg)	13.4±0.9	12.1±2.6	0.95
Sex(M/F)	9/6	10/5	0.85

According to the causes the clinical presentation most commonly with expiratory wheeze and cough or other symptoms as shown in table 2.

Table 2: Shows the presentation of patients.

Pulmonary symptoms before bronchoscopy	Frequency
Expiratory wheezing	11(36.6)
Chronic coughing	10 (33.3)
Respiratory distress ✧	7(23.3)
Inspiration stridor	2 (6.6)

✧ Mild to moderate respiratory distress.

The foreign body inhalation still the most common cause for a rigid bronchoscopy in children (70%), other causes include repeated chest infection not respond to proper medical treatment or chronic cough and bronchoscopy was done for exclusion diagnosis as shown in table 3.

Table 3: Show the presentation of bronchoscopy in both groups %.

Cause of bronchoscopy	Frequency
Foreign body	21(70)✧
Respiratory distress(diagnostic)	6(20)
Others	3(10)

✧ Mild to moderate respiratory distress.

The changes in arterial oxygen saturation in both groups were measured and compared between them. It was more significant in group I and the difference was found more significantly at 5, 10 and 20 minutes after induction with mild reduction in oxygen saturation. Changes in group II was normal statistically (P=0.005, P=0.023 and P=0.046 respectively) as shown in fig 1.

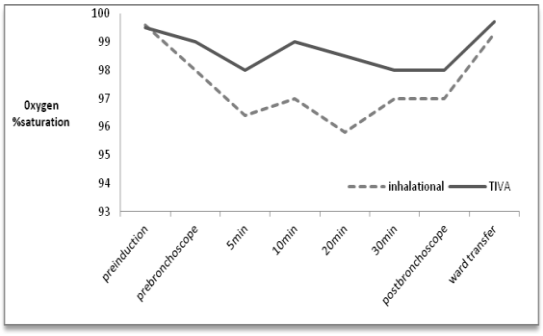

Figure I: Peripheral oxygen saturation changes during bronchoscopy

Group I shows increase in the heart rate after induction and reach a maximum after 20 minutes. While in group II heart rate was stable and decreased as in fig 2, and it was significantly different between two groups (P=0.027, 0.045 and 0.026 at 5, 10 and 20 minutes after induction respectively).

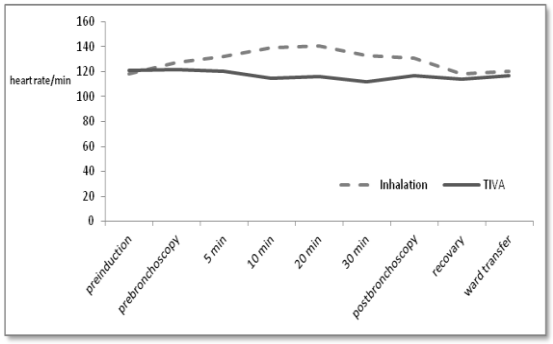

Figure 2: Heart rate changes during bronchoscopy (mean)

The rigid bronchoscopy is considered to be a traumatic to upper airway and other tissues in the mouth. The coughing and bucking were slightly less in group II than group I as shown in tablet 4.

Table 4: Post operative complication in both groups(N%).

COMPLICATIONS	COUGHING	BUCKING	LARYNGOSPASM	BRONCHOSPASM
INHALATION ANESTHESIA	6(40)	7 (46.7)	2 (13.3)	1(6.7)
TOTAL INTRAVENOUS ANAESTHESIA(TIVA)	5(33.3)	2(13.3)	1(6.7)	0
P VALUE	P=1	P=0.64	P=0.31	P=O.85

DISCUSSION:

Foreign body inhalation is still common in Iraq and it occurs in all age group, but infant and small children suffer most commonly. Presentation of foreign body is a traid of coughing , chocking and wheeze [8] .

Because of a competition on the airway between the surgeon and the anaesthetist, so safe anaesthesia , good oxygenation and hemodynamic stability is mandatory during this procedure.

In our study, comparing heart rate in two groups, we saw a higher rate of tachycardia in group I, especially at 5 and 20 minutes after induction and at the end of a bronchoscopy. Two cases of a bradycardia were reported in a group II treated by decreasing the dose of a TIVA and giving atropine (0.02*mg/kg*).

Buking , coughing and airway spasm were more at group I compare with group II. Some rigidity happened in a TIVA group but it's not significant because of use of muscle relaxant.

There was not any significant difference in recovery between both group at recovery time and the time of transfer to ward.

The hemodynamic stability were reported in rigid bronchoscope using TIVA with suxamethonium with a higher satisfaction of surgeon as in study of Razavi [9].

Hanwell el al used a controlled ventilation and muscle relaxant. Hypoxia was seen in 20%, reintubation in a 21%, need for extubation in recovery or ICU because of a prolonged recovery was reported in a 47% of these patients [10].

We try to avoid manually positive pressure ventilation after administration of muscle relaxant in order to avoid dislodgement of foreign body distally.

General anaesthesia using remifentanyl with a controlled ventilation present with more hemodynamic stability and heart rates compare with fentanyl as with the result of Voyagis [9].

Perrin et al suggested IV anaesthesia with a propofol and spontaneous assisted ventilation. They recommended that muscular relaxation may be dangerous because of near tracheal stenosis and lack of tolerance supine position in a giant paratracheal or mediastinal tumor in these patients [5].

Natalini el al compared the effectiveness of two modalities of external ventilation during rigid bronchoscopy, intermittent negative pressure ventilation and external high-frequency oscillation (EHFO) [5].

In advantage of TIVA is a constant level of anaesthesia irrespective to ventilation. By contrast, hypoventilation and leak around the rigid bronchoscopy may produce an inadequate depth of inhaled anaesthesia with leak around the rigid bronchoscopy that reduce the concentration of inhaled agent and causes awakening. All these factors with effect of volatile agent on the cardiovascular system lead to reduce oxygen saturation, increase heart rate and arrhythmia which is greatly reduced in a TIVA [10].

The sedation and analgesia produced by dexmedetomidine are achieved without significant respiratory or hemodynamic compromise[11].

We observe a good depth of anaesthesia in a TIVA group and better acceptance by the surgeon compare with group I (inhalationa group).

Stephan malharbe describe the of use of TIVA and spontaneous respiration as effective method for anaesthesia for airway endoscopy as laser surgery and use microlaryngeal tube. Cough was 27% with use local anaesthetic drug [6] .

The anaesthetic management depend mainly upon the location of foreign body, severity of obstruction and clinical presentation. In near total airway obstruction , inhalational anaesthesia is the anaesthetic technique of choice [12].

Propofol with or without remifentanyl is the technique of choice providing good airway reflex

suppression, rapid emergence and decreased pollution and this technique has been used in children less than one month age [13].

The presence of environmental pollution is the risk of inhalational anaesthesia which is not present in TIVA group [14].

The lock of unpleasant odor, less airway irritation and acceptable relaxation make TIVA a good choice of anaesthesia.

CONCLUSION AND RECOMMONDATION:

TIVA method of anaestheia for a rigid bronchoscope is a good choice of anaesthesia in paediatrics with more hemodynamic stability in regard to the oxygen saturation and heart rate and with less coughing, bucking, laryngeal spasm and bronchospasm .

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