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A RANDOMIZED COMPARATIVE STUDY OF INTRAVENOUS ANAESTHESIA WITH INTERMITTENT MASK ASSIST VENTILATION VS PREPLACED ENDOTRACHEAL TUBE WITH INTERMITTENT ASSIST VENTILATION DURING FIBREOPTIC BRONCHOSCOPIC PROCEDURES AS A DAY CASE.

Anaesthesiology

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ABSTRACT

Aim- To compare the assisted ventilation either with bag valve mask or endotracheal tube with connecting piece catheter mount using bag and valve along with propofol and ketamine during elective day case Fiberoptic bronchoscopy patients / Bronchoalveolar lavage & endobronchial biopsy, with an aim avoiding complications, extended hospital stay and post procedure mechanical ventilation in ICU.

KEYWORDS

Fiberoptic bronchoscopy, Mask assist ventilation, Endotracheal tube assist ventilation, Day case, Anaesthesia

BACKGROUND

Flexible bronchoscopy being an invasive procedure can induce cough, pain and hypoxaemia, bronchospasm, haemorrhage etc., thus requiring deep sedation or anaesthesia with assisted ventilation to offset these adverse effects.

INCLUSION CRITERIA

Patients of either sex with ASA grade I, II, IIIA, aged between 20 to 70 years with suspected lung infections requiring broncho alveolar lavage (BAL) and endo bronchial tumours requiring biopsy to confirm the diagnosis.

EXCLUSION CRITERIA

ASA grade III B and IV with unstable life threatening condition

MATERIALS AND METHODS

200 patients undergoing flexible bronchoscopy either for bronchoalveolar lavage or bronchoalveolar lavage with endobronchial biopsy were divided into two groups. Group I (MV) patients (100 patients) received propofol 2.0 mg/kg and ketamine 1.0 milligram/kg and midazolam 1 mg IV with intermittent bag valve mask ventilation after removing the bronchoscope. And Group II (ETV) (100 patients) received propofol 2.0 mg/kg and ketamine 1.0 milligram/kg, midazolam 1 mg IV along with endotracheal intubation assisted with connecting piece catheter mount which permits a port to insert either bronchoscope or a suction catheter, attached bag valve ventilation in a randomised control study. The parameters measured between the groups included haemodynamics, maintenance of oxygen saturation, cough, respiratory rate, sedation levels, need for rescue doses, recovery time to reach normal SPO2 as well as pulmonologist and patient satisfaction. The procedure discontinued when the SPO2 dropped to 80% and again continued after bringing back SPO2 to pre-procedure level either with mask assisted ventilation or ETV assisted ventilation.

RESULTS

Almost all the measured parameters between Group I (MV) and Group II (ETV) were similar and statistically insignificant. The recovery time to bring back SPO2 to 92% is one to two minute in both the groups and pre-procedure level in 3 -5 minutes in both the mask ventilation and ETV ventilation group, in between the procedure or after the completion of the procedure totally. But both groups were discharged after three hours.

CONCLUSION

We can hereby conclude that Total Intravenous Anaesthesia (TIVA) along with assisted ventilation either with MV or ETV connected to ambu bag, can be used during the fiberoptic bronchoscopic procedure for broncho alveolar lavage and endo bronchial biopsy of the lesions to avoid dangerous hypoxemia levels with drop in SPO2. This can be done by removing the scope from the bronchus when the SPO2 drops to 80% and bring back SPO2 levels to 92% in one minute and pre-procedure levels in three minutes in both groups. Both the methods are safe and can be used during fibre optic bronchoscopy as a day case procedure. Both the groups showed safety, without any extended in-patient stay and discharged as a day case.

Anaesthetic requirement is more in ETV group with propofol to suppress the reflexes comparatively with MV group.

Mean recovery is 12 minutes in MV group and 13 minutes in ETV group

Both methods have similar hemodynamic parameters during the procedure and also recovery characteristics.

MATERIALS AND METHODS:

This was a randomized controlled study that was done over a period of three years from 2017 to 2020 following ethical committee approval in 200 patients posted for broncho alveolar lavage, endobronchial biopsy for infections mostly to rule out tuberculosis, hospital acquired pneumonias, post tracheostomy patients, auto immune disorders like sarcoidosis, pre operative evaluation of patients planned for lung surgical procedures like pneumonectomy, lobectomy and tracheo-esophageal fistulas.

STUDY DESIGN:

Randomized control study

PRE PROCEDURE PREPARATION:

Pre anaesthetic assessment, history, physical examination, routine blood investigations, counts, haemoglobin, coagulation profile when biopsy is needed, ECG, chest x-ray, CT chest. CT Chest not only helps to diagnose but also to localizes the lesion to do the procedure easily. Some patients may require pre procedural and post procedural bronchodilator nebulisation.

After obtaining the informed consent for anaesthetic sedation, intravenous anaesthesia, assisted ventilation by bag valve mask or endo tracheal tube with bag valve ventilation. All patient oxygenated by mask or nasal prongs along with ECG, NIBP, SPO2, respiratory rate monitoring before induction along with local anaesthetic spray of upper airway up to vocal cord done. Inj. Hydrocortisone 100 mg bolus, inj. Glycopyrolate 0.2mg, inj. Ondansetron 4mg given. Nose and throat sprayed with local 10 % lignocaine hydrochloride. When the pulmonologist is ready after keeping resuscitation equipment, emergency crash trolley. Injection midazolam 1 mg, inj. Ketamine 50 mg and inj. Propofol 100 mg (2mg/kg) given slowly avoiding apnoea. If patient develops apnoea AMBU assisted ventilation given.

Group A continued nasal oxygen 8-10 liters/ minute and group B intubated trachea with 8 size or 7.5 size ET tube with another 1-1.5 mg /kg body weight of inj. Propofol to suppress the airway reflexes during intubation. Succinyl choline injection kept as standby for difficult intubations.

Both the groups continued oxygen by nasal prongs/ oral oxygen and in group B, ET tube connected with connecting piece catheter mount which permits a port to insert either bronchoscope or a suction catheter along with oxygen and assisted till spontaneous respiration is achieved. Fiber optic bronchoscope passed into the tracheo bronchial tree and necessary broncho alveolar traps/ endobronchial biopsy specimen taken. During the procedure, all hemodynamic parameters continuously monitored and whenever there is drop in SPO2 below

80%, bronchoscopic procedure stopped and ventilated with Oxygen connected AMBU with bag mask in group A and in group B, ETV connected to catheter mount with oxygen and assisted the ventilation with AMBU bag.

In case of Hypotension or BP < 90/50 mmHg, a bolus of 5 mg ephedrine was given; for Bradycardia (HR < 60 beats/min) 0.3 mg atropine; for Hypertension (SBP > 180 mmHg or DBP > 100 mmHg) and tachycardia (HR > 100 beats/min and/or variation of > 20% from baseline value). Rescue doses of boluses of local anaesthetic spray 2 mL of 1% lidocaine through the side hole of the flexible bronchoscope and bolus of propofol 20 mg IV was given. The number of rescue doses were noted.

Flexible bronchoscopy was performed by an experienced bronchoscopist who used a bronchoscope of the same diameter to perform transnasal bronchoscopy in all patients or transorally with mouth prop. As a routine, all patients received sprays of 2 mL of 1% lidocaine over the vocal cords, trachea and both main bronchi. No inhaled lidocaine was administered prior to the procedure.⁸

In addition to monitoring HR, NIBP and SpO₂ at every 2 minutes intervals; cough, level of sedation, duration of procedure and recovery were noted. The entire procedure lasted over 15 – 20 mins. At the end of the procedure, the bronchoscopist was asked to use a 10-point VAS to rate patient's discomfort during the procedure, where 0 represented no discomfort and 10 represented maximum discomforts. The patient was asked to rate their discomfort using the same 10-point VAS, two hours after the end of the procedure.

Sedation is assessed by using various scales. The modified Wilson scale is a variant of the Ramsay⁹ and Wilson¹⁰ scales is simple to use with an inter-rater agreement of 84%.¹¹ But for more precision, the observer's assessment of alertness/sedation (OAA/S) was chosen, as it has an inter-rater agreement that varies between 85% and 96% depending on the level of sedation.¹² where scores corresponding to sedation levels are 5 - alert, 4 - light, 3 - moderate, 2 - deep and 1 - unconscious. But we used post anaesthetic recovery score using activity, breathing, circulation, consciousness and 0, 1, 2 grades were given. 2 grade is considered pre procedural levels and 0 and 1 in between levels of grading.

Recovery criteria: Post anesthetic care unit (PACU) criteria

Activity

- 0 - unable to lift the head or move extremities voluntarily or on command
- 1 - Lifts head spontaneously moves extremities voluntarily or on command
- 2 - Ambulate without assistance

Breathing

- 0 – apnoeic
- 1 – Dyspnoea or shallow, irregular breathing
- 2 – able to breathe deeply and cough on command

Circulation

- 0 – systolic BP below 80mm of Hg
- 1 – Systolic BP above 100mm of Hg
- 2 – Systolic BP with normal limits for patient

Consciousness

- 0 - not responding or responding only to painful stimuli
- 1 – Responds to verbal stimuli but falls asleep readily
- 2 – Awake alert and oriented time, person and place

Total score must be 7 prior to discharge

Activity Breathing Circulation Consciousness Total score

Basal

MV 22228

ETV 22228

2 min

MV 02215

ETV 02215

4 min

MV 12216

ETV 12216

6 min

MV 12216

ETV 12216

8 min

MV 12216

ETV 12216

10 MIN

MV 12216

ETV 12216

12 MIN

MV 22217

ETV 12216

14 MIN

MV 22217

ETV 22217

RESULT

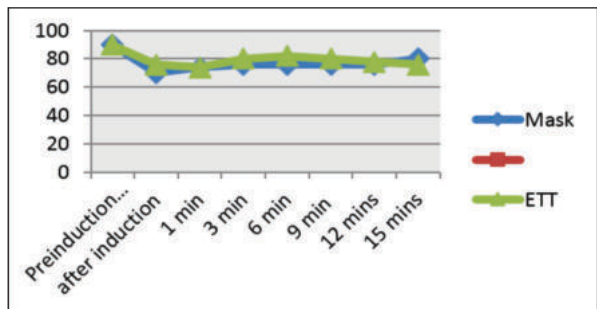
Mask ventilation vs ETV ventilation

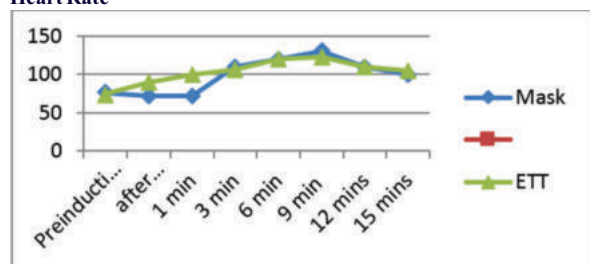
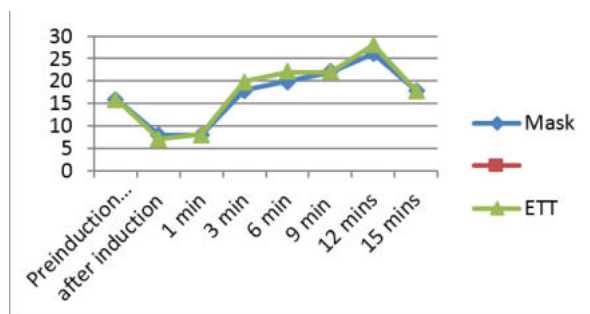
Parameter (Mean)	Mask ventilation with O ₂	ETV ventilation with O ₂
Age	Mean age: 40 years	44 years
Gender		
Male	64	68
Female	36	32
BMI	23.5	24.5
ASA Grade I/II/IIIA	20/49/31	30/60/10
Duration of procedure	15 minutes	15 minutes
Indication	BAL - 68 BAL + Biopsy-32	BAL - 70 BAL + Biopsy - 30

0HEMODYNAMIC PARAMETERS:

A. Heart rate	Mask ventilation with O ₂	ETV ventilation with O ₂
Tachycardia	90	93
Bradycardia	5	3
SVT	2	2
VPCS	3	2
Systolic hypertension (>20 % of basal value) and hypotension	90 10	92 8
Diastolic hyper and hypotension	88 12	90 10
SPO ₂ . 90- 100 80 - 90	88 12	92 8
Regaining of SPO ₂ after stopping procedure	3-4 minutes	3- 5 minutes
Cough during procedure	70	60
Sedation score (PACU) 12 minutes 13 minutes	100	100
Pulmonologist satisfaction	100/100	100/100
Patient comfort Discomfort	99 1	98 2

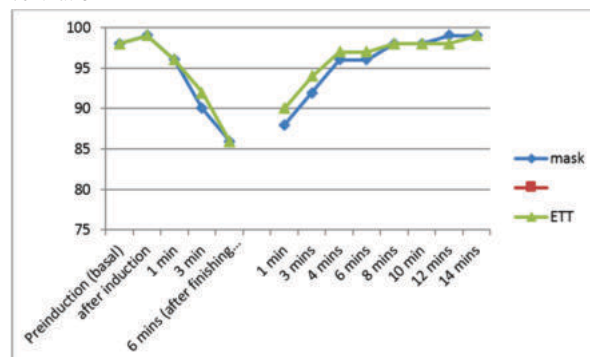
Mean Arterial Blood Pressure



Heart Rate**Mean Respiratory rate**

Mean SPO2 during the procedure and after the procedure with assisted mask / ETV ventilation

During bronchoscopy After withdrawing bronchoscope and assisted ventilation

**DISCUSSION:**

Ambulatory diagnostic fibre optic bronchoscopy for diagnostic and therapeutic had done either with local anaesthetic spray/ nerve block / IV anaesthesia. In view of pain non cooperation, discomfort stimulating when done under local and nerve block. We have chosen an IV anaesthesia which will facilitate procedure easily without side effects with patient comfort and satisfaction and pulmonologist / bronchoscopist satisfaction with proper monitoring and oxygen supplementation either with nasal prongs, mask or with endotracheal tube during spontaneous ventilation.

We have given Inj. Propofol 2mg /kg and inj. Ketamine 1 mg/ kg + midazolam 1mg. Propofol is a rapidly acting inducing agent with smooth and fast recovery. Ketamine has got analgesia which alleviates stimulating reflexes of the airway with bronchodilator property and midazolam causes amnesia and reduces emergence phenomena which is characteristic of ketamine. We have chosen two groups after the induction. Group 1 (Mask) and group 2 (ETT) both were given the above medications slowly with monitoring and pre oxygenation, and a rescue dose of propofol 1mg/kg during tracheal intubation in group II. Bronchoscopist start the procedure immediately after induction and during the procedure, local anaesthetic lignocaine spray, cold saline, injection adrenaline when there is bleeding biopsy. We have studied hemodynamic parameters, like blood pressure, heart rate, respiratory rate, oxygen saturation (SPO2). Propofol has got vasodilator properties which can show little drop in blood pressure during induction with reduced respiratory rate. Ketamine used as a co induction agent to reduce propofol dosage and also smooth intubation, which may require a small dose of propofol upto 50 mg.

Both the groups showed initial drop in blood pressure and respiratory rate during which trachea bronchial tree has been visualized with the fibre optic bronchoscopy. During visualization there is drop in oxygen saturation which is because of partial mechanical impairment of oxygen diffusion along with local and saline solutions irrigation to collect the samples like broncho alveolar lavage (BAL), biopsy – either endobronchial or peribronchial regions, and trans pulmonary needle aspiration biopsy. We aimed to improve oxygen saturation levels during the procedure which dropped 85 % and immediately after the procedure to bring it back to the pre procedure levels. Drop in oxygen saturation in proportional to the duration of the procedure and to maintain safety we have withdrawn the scope when SPO2 dropped to 85% in both groups. Broncho alveolar lavage during our study finished in 5-10 minutes and bronchoalveolar lavage with biopsy took 10-13 minutes and recovery in group I was 10-12 minutes and in group II is 11- 13 minutes.

During SPO2 drops we have given oxygen by ambu bag mask ventilation after withdrawing the scope and in group II as already endo tracheal tube of 7.5 or 8 size tube present we have given oxygen through T piece after withdrawing the scope when SPO2 dropped from preprocedure level from about 98-99% to 85%. Both groups were given assisted ventilation. Both groups showed improved SPO2 in 1-3 minutes from 85 to 95% and further increase to 99% in 12 minutes totally.

In comparative study of propofol with ketamine and propofol with fentanyl with Gut et al., concluded that propofol with ketamine resulted in hemodynamic stability without the need for additional analgesia and the results are similar in our study. According to Ada Che et al, increase in heart rate, blood pressure is similar to our study.

Propofol and ketamine increase heart rate and blood pressure, whereas propofol with fentanyl increases blood pressure slightly led and slight decrease in heart rate when compared to Propofol and ketamine similar to Fernando and Ramakrishnan study correlates to our study. No statistical significance in cough, sedation, rescue doses, recovery times study conducted by Knox et al., 1970.

Recovery time alone was statistically slightly significant in group II (ETT), 13 minutes compared to 12 minutes in group I (MV) because ETV ventilation required extra rescue dose of propofol to suppress the airway reflexes during intubation and to maintain the tube insitu without cough.

Knox et al., 1970 13.2 minutes +- 1.2 minutes is similar to our study . The comfort and satisfaction score 10 point visual analog score by the bronchoscopist and the patient showed no difference between intermittent mask ventilation and endo tracheal tube intermittent ventilation. Emergence delirium is a concern with ketamine but our study no significant emergence due to the midazolam 1mg/kg totally given along with ketamine similar to Shirley and Risk and Enoy. The emergene is due to probably rate of neurological recovery from brain which is circumvented on co induction with propofol and midazolam.

CONCLUSION:

It's hereby concluded by this study that fibreoptic bronchoscopy can be safely done as a day case with iv sedation propofol 2mg/kg/min with inj. Ketamine 1mg/kg with midazolam 1 mg to give patient comfort along with bronchoscopist satisfaction for bronchoalveolar lavage and bronchial biopsy.

During the procedure hemodynamic parameters are stable except SPO2 which can drop upto 85 % SPO2 after 3 minutes which can be brought back to pre procedural levels by removing the bronchoscope from tracheobronchial tree and ventilating either with oxygen enriched AMBU bag mask or by endotracheal tube connected to catheter mount attached to oxygen enriched assisted ventilation in 1- 2 minutes to SPO2 92% and to SPO2 of 98% in about 5 minutes. Rescue doses may be needed in group B more than group A.

Recovery time is 12 minutes in group I (MV) and 13 minutes in group II (ETT) to preprocedural levels as per the post operative recovery sedation score 7/8.

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hospitals, Chennai - 600026.

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