VOLUME - 13, ISSUE - 10, OCTOBER - 2024 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Anaesthesiology

EFFECTIVENES OF MASK VENTILATION AS ASSESSED BY POST INTUBATION END-TIDAL CARBON DIOXIDE AND PULSE OXIMETERY IN MORBIDLY OBESE PATIENTS UNDERGOING BARIATRIC SURGERY

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KEYWORDS :

INTRODUCTION:

Bag mask ventilation at the time of anesthetic induction is aimed at increasing oxygen storage in the body. The skill of MV is achieved through regular practice and helps in addressing common issues such as patient position, sizing of equipment and airway manoeuvres. It provides time for intubation and postpones desaturation during the process of apnea. BODY MASS INDEX: BMI ≥30 Kg/m2 is considered to be obese, BMI ≥40 kg/m2 are morbidly obese, BMI ≥60 kg/m2 are super obese. For Indian population, WHO suggests, obesity at a level > 25 kg/m2 with a higher waist circumference and excess body fat as compared to the population in the rest of the world. Obese patients are at a risk for rapid oxygen desaturation at the time of induction of anesthesia. They have decreased pulmonary and thoracic compliance, a reduction in FRC, and an increased work of breathing. Because of anatomical features as well as functional changes. A situation in which an unassisted anesthesiologist is unable to maintain oxygen saturation of the patient above the level of 90% using 100% oxygen and positive pressure ventilation in a patient with oxygen saturation more than 90% prior to the anaesthetic intervention or the anaesthesiologist is not able to avert or reverse signs of inadequate ventilation during positive pressure mask ventilation (PPMV) is called difficult mask ventilation.

Aims And Objectives:

Aims- to evaluate the effectiveness of mask ventilation as assesed by end tidal carbon di oxide and pulse oximetry in morbidly obese patients undergoing bariatric surgery.

Objectives- To note the time required to achieve effective mask ventilation taken as an expiratory tidal volume of at least 5 ml/Kg Ideal Body weight, after administration of Propofol in patients with BMI >35 Kg/m2.To assess the effectiveness of expiratory tidal volume of 5ml/Kg as judged by oxygen saturation by pulse oximetry and end tidal Carbon-dioxide (EtCO2) reading just after intubation.

MATERIALS AND METHODS:

Design- The study was a Prospective Observational Study conducted at SAMC and PG institute Indore.

Sample- According to inclusion and exclusion criteria this study included 180 patients.

Criteria For Inclusion

- Age group of 18- 70 years of both sexes
- BMI ≥35 Kg/m2,
- ASA grade I,II and III ,IV,
- Patients coming for elective surgeries under general anesthesia

Criteria For Exclusion

- Patient refusal
- BMI< 35 kg/m2
- Age below 18 years and above 70 years
- Anticipated difficult airway in whom awake intubation or tracheostomy is planned
- Patients with full stomach
- Patients posted for emergency surgery.

METHODS-

- Mallampati grading- relates amount of mouth opening to the size of the tongue and provides an estimate of space available
- Thyromental distance(TMD) of less than 6.5cm proves difficult
- Presence/ Absence of facial hair
- Neck circumference-NC ≥ 32cm in females and ≥ 38cm in males were determined cutoff values to predict central obesity.
- Osa
- Stopbang Score

One hundred and eighty morbidly obese patients with BMI ≥ 35 kg/m2 fulfilling the inclusion criterion were recruited for the study. Data was collected in a pre-structured proforma.Each patient was monitored routinely with an electrocardiogram, pulse oximetry, and non- invasive arterial pressure. Patients were made to breathe 100% oxygen through a facemask for more than 3 minutes. After shifting the patient inside the operation theatre on the day of surgery, all the routine monitors was attached. All patients were placed in a head elevated ramped up position. After adequate pre-oxygenation, induction was started. Once propofol was administered and patient stopped following verbal command, mask ventilation was commenced.

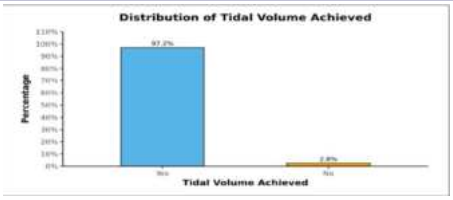
Anaesthesia was induced with Injection propofol (1mg /kg) and tracheal intubation facilitated with Injection Atracurium (0.7 mg /kg).Posterior tracheal compression would be applied if requested by the intubator. A suitable sized Macintosh laryngoscope blade was used for the first laryngoscopy in each case. In case intubation is not possible with macintosh laryngoscope blade then MC coy blade, bougie, stylette etc was used.The time required to achieve a expiratory tidal volume of 5ml/Kg IBW were noted from this point and recorded. Difficulty or ease of mask ventilation was also be noted depending on requirement of airway or any other adjunct and feedback from anesthesiologist performing the case. Minimum Oxygen saturation from pulse oximetery during MV was recorded. After intubation, the first reading of EtCO2 was also noted.

Observation:

Distribution of the Participants in Terms of Tidal Volume Achieved

Tidal Volume Achieved	Frequency	Percentage	95% CI
Yes	175	97.2%	93.3% - 99.0%
No	5	2.8%	1.0% - 6.7%

97.2% of the participants had Tidal Volume Achieved: Yes. 2.8% of the participants had Tidal Volume Achieved: No.



Comparison of the 3 Subgroups of the Variable Post Intubation EtCO2 inTerms of Time to Achieve Tidal Volume

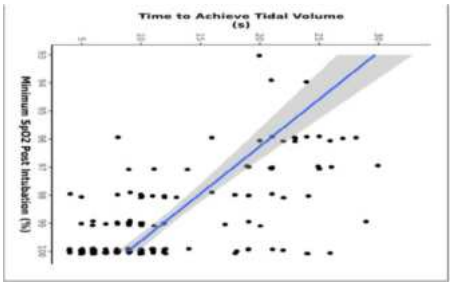
Time to Achieve Tidal Volume (s)	Post Intubation EtCO2			Kruskal Wallis Test	
	<35 mmHg	35-45 mmHg	>45 mmHg	χ^2	p value
Mean (SD)	8.24 (3.06)	18.69 (6.33)	NaN (NA)	82.910	<0.001
Median (IQR)	8 (6 10)	20 (12 24)	NA (NA NA)		
Range	4 – 23	5 30	Inf Inf		
Pairwise Comparison of Subcategories of Post Intubation EtCO2				Adjusted P Value	
<35 mmHg - 35-45 mmHg				<0.001	

Association Between Post Intubation EtCO2 and Tidal Volume Achieved

Tidal Volume Achieved	Post Intubation EtCO2				Kruskal Wallis Test	
	<35 mmHg	35-45 mmHg	>45 mmHg	Total	$\chi2$	P Value
Yes	114 (100.0%)	61 (96.8%)	0 (0.0%)	175 (97.2%)	108.294	<0.001
No	0 (0.0%)	2 (3.2%)	3 (100.0%)	5 (2.8%)		
Total	114 (100.0%)	63 (100.0%)	3 (100.0%)	180 (100.0%)		

Post Intubation EtCO2	Adjusted P Values
<35 mmHg vs. 35-45 mmHg	0.125
<35 mmHg vs. >45 mmHg	<0.001
35-45 mmHg vs. >45 mmHg	<0.001

correlation between Minimum SpO2 Post Intubation (%) and Time to Achieve Tidal volume



Comparison of the 2 Subgroups of the Variable Minimum SpO2 Post Intubation in Terms of Tidal Volume (mL)

Tidal Volume (mL)	Minimum SpO2 Post Intubation		Wilcoxon-Mann-Whitney U Test	
	<95 %	≥95 %	W	p value
Mean (SD)	339.25 (39.50)	291.62 (54.69)	1028.500	0.018
Median (IQR)	345 (325-361.25)	285 (248.75-336.25)		
Range	264 – 395	155 - 410		

RESULT:

The average time to achieve target tidal volume(5ml/kg) was 11.88 seconds for BMI up to 47kg/m2 B.M.I. of > 47 kg/m2 especially in super obese patients tidal volume is not sufficient for effective mask ventilation. Post-intubation EtCO2 and SpO2 are good indicators for effectiveness of bag and mask ventilation. SpO2 is a more sensitive indicator of effectiveness of BMV as compared to EtCO2.Study concludes that The Mallampatti grading, presence of beard, thyromental distance, neck circumference, and obstructive sleep apnea (OSA) are all predictors of difficult bag mask ventilation.

DISCUSSION:

Mask ventilation (BMV) is an important step during induction.Effective BMV ensures prevention of hypoxemia during apnea required for intubation. This study was done to explain the dynamics involving BMV and factors predicting difficult BMV such as presence of facial hair, neck circumference, thyromental distance.

In this study the mean time for achieving the desired tidal volume was 11.88 seconds.

Time for achieving tidal volume increased with increase in neck circumference, stop bang score, facial hair and thyromental distance indicating difficult BMV Khetarpal et al had recorded an incidence of 0.15% in their study for predicting impossible mask ventilation. The incidence of failed mask ventilation was 2.7% in our study.

Baraka et al in their study found a significant negative correlation between the time to oxy-haemoglobin desaturation and body mass index. BMI ≥ 50 Kg/ m2 has proven to be an important predictor of difficult BMV.

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