EFFECTS OF VARYING PERIODS OF PRE-OXYGENATION ON INTRAOPERATIVE OXYGEN SATURATION AND ITS HEMODYNAMIC EFFECT ON HEALTHY ASA I AND II CLASS PATIENTS- A TERTIARY CARE EXPERIENCE

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ABSTRACT

BACKGROUND
Pre-oxygenation with 100% oxygen is performed routinely before induction of anaesthesia. The purpose of pre-oxygenation is to increase the body oxygen stores and to replace nitrogen in the lungs by an equivalent volume of oxygen, thus delaying the onset of oxygen desaturation and hypoxemia during the apnoeic period following induction of anaesthesia. The objectives of this study were to compare the effects of varying periods of preoxygenation on intraoperative oxygen saturation and its hemodynamic effect.

MATERIALS AND METHODS
Sixty adults ASA I and II patients scheduled for surgery under general anaesthesia were divided into three groups according to method of pre-oxygenation. In Group 1 (n=20) patients were preoxygenated for 60 seconds, Group 2 (n=20) patients were pre-oxygenated for 120 seconds and Group 3 (n=20) patients were preoxygenated for three minutes of tidal volume breathing using oxygen flow of 6 $Lmin^{-1}$. Following preoxygenation, face mask oxygenation was continued until the patient got relaxed and then trachea was intubated. Intraoperative saturation was measured using pulse oximetry after every 5 minutes along with other hemodynamic parameters.

RESULTS
The mean values of intraoperative oxygen saturation at 5 min, 10 min, 15 min and 20 min among three groups did not fall significantly and were statistically non-significant between the three groups (p value of > 0.05). Likewise, at different intervals of intraoperative stage like after 30 min, 45 min, 60 min, 75 min, 90 min, 105 minutes, the values remain same and statistically non-significant (p value> 0.05). Regarding vital parameters (heart rate, blood pressure, respiratory rate, oxygen saturation), there was non-significant difference between the three study groups (p value >0.05).

CONCLUSION
Rapid preoxygenation by one-minute and two-minutes, normal tidal volume breathing technique is equally efficient to three minutes of preoxygenation in healthy patients.

KEYWORDS
Preoxygenation, Vital Capacity, Desaturation, Intraoperative Vitals.

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BACKGROUND

Pre-oxygenation with 100% oxygen is performed routinely before induction of anaesthesia. Its goal is to increase the body's oxygen stores by replacing nitrogen in the lungs by an equivalent volume of oxygen, thus delaying the onset of arterial desaturation and hypoxemia during the apnoeic period following induction of anaesthesia.[1] The desaturation is thought to be of more significance during induction when things are already on the knee of the haemoglobin- oxygen dissociation curve and desaturation will then be immediate and profound.[2]

The need for denitrogenation of anaesthetized patients has been understood for the past two and a half decade.[3] by replacing the alveolar nitrogen with oxygen, only three gases remain in the alveoli- oxygen, carbon dioxide and

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water vapours. Since the P_{H2O} is constant at 47 mm Hg and the PCO_2 cannot rise higher than the PCO_2 of mixed venous blood (46 mm Hg) the remainder of the alveolar partial pressure must be exerted by the oxygen.[4]

During airway management, the maintenance of normal oxygen saturation is critical to patient safety as oxygen desaturation to below 70% puts patient at risk for dysrhythmia, hemodynamic decompensating, hypoxic brain injury, and death. The rate of desaturation may be rapid in an apnoeic period if the patient is not pre-oxygenated. The challenge for anaesthesiologists is to secure airway rapidly with endotracheal tube or LMA without critical hypoxia or aspiration. In patients with normal pulmonary reserves, optimal haemoglobin levels or low metabolic demands and an initial normal pulse oximetry reading on room air, there is a low risk of desaturation after adequate preoxygenation. Conversely, the patient, who is already hypoxemic (oxygen saturation 90%) e.g a patient with COPD or patient with multipolar pneumonia, despite the preoxygenation with 100% oxygen, there is an immediate risk of critical tissue hypoxia during tracheal intubation in these patients.[5,6]

Preoxygenation provides a safety back up during periods of hypoventilation and apnoea while tracheal intubation is being done. It prolongs the duration of safe apnoea, defined as the time until a patient reaches a saturation (SPO_2) level of 88% to 90%, to allow for placement of a definitive airway.

In patients with high risk of aspiration caused by bowel pathology, body habitus pregnancy or any systemic or critical illness, anaesthesiologists developed rapid sequence induction. This technique involves the simultaneous administration of the anaesthetic inducing agent and a rapidly acting muscle relaxant (e.g. succinylcholine or rocuronium) with no positive pressure ventilation while waiting for the neuromuscular agent to take its effect. Besides in the field of anaesthesiology, this rapid sequence induction method has been adapted to the emergency department (ED), where all patients requiring airway management are presumed to be at risk for aspiration. In a patient breathing room air before rapid sequence tracheal intubation (PaO_2 90 to 100 mm Hg), desaturation will occur in the 45 to 60 seconds between the induction anaesthesia and airway placement. In the 1950s, anaesthesiologists realized that the safest way to perform rapid sequence tracheal intubation would be by filling the patient's alveoli with a high fraction of inspired oxygen (FiO_2) before the procedure.[7] Studies by Watson and Heller teal show markedly increased time to desaturation if the patients received preoxygenation with 100% oxygen rather than room air before tracheal intubation.[8,9] In preoxygenation, the targets to be achieved are: (1) to bring the patient's oxygen saturation close to 100%; (2) to denitrogenate and maximally oxygenate the blood compartment and (3) to denitrogenate the residual capacity of the lungs (maximizing oxygen storage in the lungs). The first 2 goals are imperative; de nitrogenating and oxygenating the blood adds little to the duration of safe apnoea because oxygen is poorly soluble in blood, and the blood is a comparatively small oxygen reservoir compared with the lungs (5% versus 95%).[10]

The necessary duration of pre-oxygenation has been debated and studied extensively, with techniques including three minutes of tidal volume breathing, four vital capacity breaths in 60 seconds or eight vital capacity breaths in 30 seconds. To some extent these fixed regimens are unnecessary in the presence of end tidal oxygen monitoring (ETO_2). If this monitoring is available it is possible to observe the rise in ETO_2 on a breath-by-breath basis, with an endpoint of achieving an ETO_2> 85% (100% is not achievable due to the presence of CO_2 and water vapours). The actual time required will vary between patients; it may be achieved more quickly than three minutes, especially if a patient with smaller FRC. The filing of the FRC with oxygen can be described by a wash-in curve and the contrasting process of de-nitrogenation is represented by a wash-out curve. Both processes are negatively exponential and allow for an understanding of the methods for pre-oxygenation suggested.[11]

Aims and Objectives

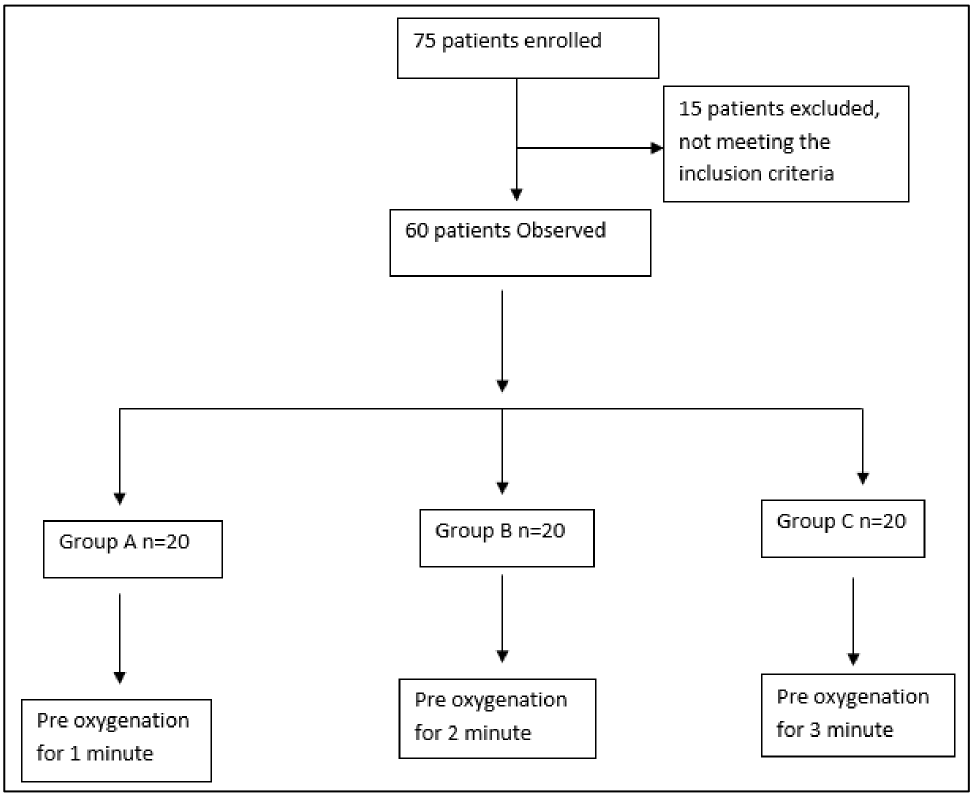
The present study was conducted to compare and study the effects of varying periods of pre-oxygenation, on oxygen saturation, time required for recovery of oxygen saturation after intubation and its hemodynamic effects, so as to arrive at a value of the optimal duration of pre-oxygenation.

MATERIALS AND METHODS

The present study was conducted in the department of anaesthesiology Government Medical College Srinagar from 2015 to 2017. The study population consisted of 60 adults ASA I and II patients in the age group of 20 –60 years of either sex scheduled for elective surgery under general anaesthesia requiring endotracheal intubation. Patients were randomly divided into three groups according to method of pre-oxygenation. In Group 1 (n=20) patients were pre-oxygenated for 60 seconds at oxygen flow of 6 $Lmin^{-1}$, in Group 2 (n=20) the patients were pre-oxygenated for 120 seconds at oxygen flow of 6 $Lmin^{-1}$ and in Group 3 (n=20) patients underwent pre-oxygenation for three minutes of tidal volume breathing using oxygen flow of 6 $Lmin^{-1}$.

A written informed consent was obtained from all patients participating in the study. The appropriate method of pre-oxygenation was explained to the patients during the preoperative period. All patients were transported to the operating room without premedication. On arrival to operating room, an 18-gauge intravenous (IV) catheter was inserted and monitoring of electrocardiography, non-invasive blood pressure (NIBP), oxygen saturation (SpO_2) was started and baseline values were recorded. Peripheral O_2 saturation was monitored via a finger probe pulse oximetry. Monitoring of O_2 saturation, NIBP, ECG were done before preoxygenation while patients were breathing room air and after pre-oxygenation.

Patients were alternatively assigned to three groups according to method of pre-oxygenation. Group 1 – tidal volume breathing 60 sec using flow of 6 $Lmin^{-1}$, Group 2^{nd}- tidal volume breathing for 120 sec using flow of $6Lmin^{-1}$ and Group 3rd – traditional pre-oxygenation technique, which consisted of 3 minutes of tidal volume breathing using O_2 flow at 6 $Lmin^{-1}$. Circle absorber anaesthesia system with 2 L capacity reservoir bag was used and all patients were pre-oxygenated with proper sized tight-fitting leak free anesthesia mask to prevent any leaks. Following pre-oxygenation, Face mask O_2 was continued until the patient got relaxed and then trachea was intubated with appropriately sized ETT after inj. propofol 2.5 mg/kg and inj. atracurium 0.6 mg/kg. Proximal end of the endotracheal tube was connected to anaesthesia work station (Datex-Ohmeda/Drager Fabius) on volume control mode with FiO_2 of 35%, tidal volume 10 ml/kg, RR 12/min and PEEP OF 4 cm H_2O, I:E1:2 and intra operative saturation was measured using pulse oximetry after every 5 minutes along with other hemodynamic parameters.



Consort Diagram

Patients study design. 15 patients were excluded because of associated severe comorbid conditions and results of these were not included in the study so the sample size was limited to 60 patients.

RESULTS

The treatment groups were similar with respect to age, weight, height, sex distribution and duration of surgery.

Demographic Characteristics

In group a, age ranged from 19 to 60 years with a mean age of 42.5±16.259 years. In group B, age ranged from 20 to 60 years with a mean age of 38.4±11,315 years and in group C, age ranged from 22 to 60 years with a mean age of 39.8±14.896 years. The statistical analysis between three groups was not significant (p= 0.649).

Age	N	Mean	SD	Range	p-Value	Remarks
Group A	20	42.5	16.259	18-60	0.649	Not sig.
Group B	20	38.4	11.315	20-60		
Group C	20	49.8	14.896	22-60		

Table 1

Sex Distribution

All the patients in all three groups were comparable regarding the gender of the patients and the variation in gender distribution between groups was statistically insignificant (p=0.72)

Sex		Group		
		A	B	C
Male	Count	13	15	15
	% age	65	75	75
Female	Count	07	05	05
	% age	35	25	25
Total	Count	20	20	20
	% age	100	100	100
p-Value =0.720				

Table 2

ASA Class
Majority of patients in the study population belonged to ASA class I in all the three groups. The variation in ASA class distribution of patients among different groups was statistically insignificant (p=0.431).

ASA		Group		
		A	B	C
ASA-I	Count	15	17	18
	%age	75	85	90
ASA-II	Count	5	3	2
	%age	25	15	10
Total	Count	20	20	20
	%age	100	100	100

Table 3. ASA Class of Patients

P-Value =0.431

Preoperative Vitals
The above table shows the mean values of preoperative heart rate, systolic blood pressure, diastolic blood pressure, oxygen saturation and respiratory rate among the three study groups. The statistical difference among these groups was not significant.

Vitals	Group	Mean	SD	P-Value	Remarks
HR (bpm)	A	74.30	3.541	0.145	Not Sig.
	B	76.40	4.122		
	C	74.70	2.793		
SBP (mmHg)	A	119.05	3.052	0.07	Not Sig.
	B	120.80	2.966		
	C	118.80	2.118		
DBP (mmHg)	A	76.50	2.80	0.899	Not Sig.
	B	77.00	3.584		
	C	76.80	3.847		
SPO_2	A	99.15	0.745	0.711	Not Sig.
	B	99.05	0.826		
	C	99.25	0.716		
PR (pm)	A	14.10	1.165	0.95	Not Sig.
	B	14.10	1.165		
	C	14.00	1.076		

Table 4. Pre-Operative Vitals

Intraoperative Oxygen Saturation
During the first five minutes, the mean intraoperative oxygen saturation in group A, was 99.20±1.056%, In group B the mean intraoperative oxygen saturation was 99.35±0.745% and in group C the mean intraoperative oxygen saturation was 99.88±0.973 with p value of 0.498. After five minutes of intubation, the mean intraoperative oxygen saturation in group A, was 98.95±1.099, in group B the mean intraoperative oxygen saturation was 99.15±0.875 and in group C the mean intraoperative oxygen saturation was 98.95±1.05 with a p value of 0.772. After 20 minutes the mean intraoperative oxygen

saturation was 98.75±1.164 in group A, in group B the mean intraoperative oxygen saturation was 98.85±75 and in group C the mean oxygen saturation was 99.05±0.999 with a p value of 0.609. Likewise, at different intervals of intraoperative stage like after 30 min, 45 min, 60 min, 75 min, 90 min, 105 minutes the values remain same as shown in the table below.

The mean values of intraoperative oxygen saturation at different intervals among three groups were statistically not significant with a p value of >0.05.

Time	Group	Mean	SD	P-Value	Remarks
0M	A	99.20	1.056	0.498	Not Sig.
	B	99.35	0.745		
	C	99.00	0.973		
5M	A	98.95	1.099	0.772	Not Sig.
	B	99.15	0.875		
	C	98.95	1.05		
10M	A	99.10	1.071	0.983	Not Sig.
	B	99.15	0.933		
	C	99.15	0.933		
15M	A	98.85	1.089	0.944	Not Sig.
	B	98.85	1.04		
	C	98.95	1.099		
20M	A	98.75	1.164	0.609	Not Sig.
	B	99.75	1.118		
	C	99.05	0.999		
25M	A	99.25	0.967	0.697	Not Sig.
	B	99.20	1.005		
	C	99.00	0.973		
30M	A	98.95	1.05	0.748	Not Sig.
	B	99.15	0.988		
	C	99.15	0.813		
45M	A	98.95	1.146	0.745	Not Sig.
	B	99.15	0.933		
	C	98.90	1.165		
60M	A	98.75	1.164	0.919	Not Sig.
	B	98.70	1.174		
	C	98.85	1.182		
75M	A	99.30	0.865	0.776	Not Sig.
	B	99.15	0.933		
	C	99.10	0.968		
90M	A	99.60	1.188	0.966	Not Sig.
	B	98.65	1.226		
	C	98.70	1.218		
105M	A	99.10	1.071	0.876	Not Sig.
	B	99.25	0.786		
	C	99.15	0.933		

Table 5. Intra Operative Oxygen Saturation (%)

Intra Operative Respiratory Rate (Per Minute)

The mean values of intraoperative respiratory rate at different intervals among three groups were statistically not significant with a p value of >0.05.

Time	Group	Mean	SD	p-Value	Remarks
0M	A	13.70	1.302	0.879	Not Sig.
	B	13.60	1.273		
	C	13.50	1.147		
5M	A	13.15	0.875	0.855	Not Sig.
	B	13.10	0.912		
	C	13.00	0.95		

10M	A	13.55	1.317	0.753	Not Sig.
	B	13.75	1.293		
	C	13.85	1.226		
15M	A	13.30	0.923	0.928	Not Sig.
	B	13.20	0.951		
	C	13.20	0.951		
20M	A	14.10	1.165	0.95	Not Sig.
	B	14.10	1.165		
	C	14.00	1.076		
25M	A	13.25	1.02	0.814	Not Sig.
	B	13.20	1.056		
	C	13.05	0.999		
30M	A	14.00	1.257	0.957	Not Sig.
	B	14.00	1.257		
	C	13.90	1.165		
45M	A	13.30	0.979	0.802	Not Sig.
	B	13.25	1.02		
	C	13.10	0.968		
60M	A	13.70	1.302	0.879	Not Sig.
	B	13.60	1.273		
	C	13.50	1.147		
75M	A	13.15	0.875	0.855	Not Sig.
	B	13.10	0.912		
	C	13.00	0.795		
90M	A	13.55	1.317	0.753	Not Sig.
	B	13.75	1.293		
	C	13.85	1.226		
105M	A	13.30	0.923	0.928	Not Sig.
	B	13.20	0.951		
	C	13.20	0.951		

Table 6. Intra Operative Respiratory Rate (Per Minute)

Intra Operative Heart Rate (Per Minute)

The mean values of intraoperative heart rate at different intervals among the three groups were statistically not significant with a P value of >0.05.

Time	Group	Mean	SD	P-Value	Remarks
0M	A	77.05	4.084	0.458	Not Sig.
	B	76.25	3.905		
	C	75.60	2.836		
5M	A	74.30	3.541	0.102	Not Sig.
	B	76.40	4.122		
	C	74.25	2.918		
10M	A	75.70	3.757	0.465	Not Sig.
	B	75.30	2.598		
	C	75.70	4.402		
15M	A	75.15	4.146	0.125	Not Sig.
	B	75.90	3.611		
	C	73.45	3.395		
20M	A	78.05	4.224	0.454	Not Sig.
	B	76.50	3.154		
	C	77.05	4.298		
25M	A	73.85	3.014	0.241	Not Sig.
	B	75.05	4.224		
	C	76.10	5.015		

30M	A	75.55	3.591	0.68	Not Sig.
	B	74.90	5.581		
	C	76.15	4.03		
45M	A	76.00	4.129	0.469	Not Sig.
	B	75.25	6.82		
	C	74.05	3.471		
60M	A	75.35	4.32	0.543	Not Sig.
	B	76.15	3.345		
	C	76.70	3.868		
75M	A	75.75	3.726	0.638	Not Sig.
	B	76.95	4.236		
	C	76.55	4.199		
90M	A	75.50	2.893	0.334	Not Sig.
	B	76.95	4.236		
	C	75.40	3.747		
105M	A	75.75	3.796	0.076	Not Sig.
	B	76.90	4.241		
	C	74.10	3.401		

Table 7. Intra Operative Heart Rate (Per Minute)

Intra Operative Systolic Blood Pressure (mmHg)

The mean values of intraoperative systolic blood pressure at different intervals among three groups were statistically not significant with a p value of >0.05.

Time	Group	Mean	SD	P-Value	Remarks
0M	A	119.55	4.651	0.38	Not Sig.
	B	120.75	3.193		
	C	119.25	2.573		
5M	A	119.05	3.052	0.225	Not Sig.
	B	119.65	2.033		
	C	118.20	2.707		
10M	A	119.75	2.381	0.328	Not Sig.
	B	118.60	3.733		
	C	117.35	7.506		
15M	A	119.45	2.089	0.373	Not Sig.
	B	117.35	7.443		
	C	118.30	2.515		
20M	A	118.40	8.035	0.814	Not Sig.
	B	119.15	2.907		
	C	117.80	7.764		
25M	A	116.75	7.283	0.58	Not Sig.
	B	116.95	7.359		
	C	118.60	2.257		
30M	A	120.00	2.257	0.839	Not Sig.
	B	119.10	8.058		
	C	119.95	3.9		
45M	A	120.35	3.392	0.226	Not Sig.
	B	119.00	7.518		
	C	116.35	9.74		
60M	A	119.85	3.924	0.491	Not Sig.
	B	119.45	2.892		
	C	118.55	3.634		
75M	A	120.15	4.392	0.446	Not Sig.
	B	118.80	2.745		
	C	119.15	3.014		

90M	A	118.80	3.205	0.382	Not Sig.
	B	119.95	2.724		
	C	119.75	2.724		
105M	A	119.59	4.568	0.999	Not Sig.
	B	119.60	4.089		
	C	119.54	2.238		

Table 8. Intra Operative Systolic Blood Pressure (mmHg)

Intra Operative Diastolic Blood Pressure (mmHg)
The mean values of intraoperative Diastolic blood pressure at different intervals among three groups were statistically not significant with a p value of >0.05.

Time	Group	Mean	SD	P-Value	Remarks
0M	A	78.25	4.745	0.336	Not Sig.
	B	77.85	4.271		
	C	79.70	3.213		
5M	A	77.10	3.291	0.335	Not Sig.
	B	76.90	3.37		
	C	78.30	2.94		
10M	A	76.60	2.458	0.587	Not Sig.
	B	76.06	2.704		
	C	75.50	4.513		
15M	A	76.30	3.114	0.996	Not Sig.
	B	76.20	5.064		
	C	76.30	3.643		
20M	A	76.15	4.043	0.355	Not Sig.
	B	77.20	2.215		
	C	75.60	4.044		
25M	A	77.05	4.442	0.996	Not Sig.
	B	76.95	4.347		
	C	76.95	2.665		
30M	A	76.50	2.585	0.643	Not Sig.
	B	75.50	4.31		
	C	76.05	2.929		
45M	A	77.20	3.518	0.641	Not Sig.
	B	76.30	5.131		
	C	75.75	5.379		
60M	A	77.55	2.239	0.773	Not Sig.
	B	77.10	2.245		
	C	77.45	1.82		
75M	A	78.35	1.755	0.673	Not Sig.
	B	77.75	2.381		
	C	77.95	2.305		
90M	A	77.95	3.776	0.795	Not Sig.
	B	78.55	4.211		
	C	77.65	4.771		
105M	A	77.05	3.441	0.492	Not Sig.
	B	77.80	3.412		
	C	76.55	3.103		

Table 9. Intra Operative Diastolic Blood Pressure (mmHg)

DISCUSSION
Pre-oxygenation with 100% oxygen has been proved very advantageous in general anaesthesia. Maximal pre-oxygenation is achieved when alveolar, arterial tissue and venous compartments are filled with oxygen. However, patients with a compromised oxygen carrying capacity, like those with decreased functional residual capacity, anaemia, poor alveolar ventilation, decreased cardiac output and or an increased oxygen extraction, become hypoxic during apnoea much faster than healthy individuals, hence in

these conditions and in case of difficult airway, maximal pre-oxygenation is mandatory. Moreover, because of the difficult airway, situation is largely unpredictable, hence the need to pre-oxygenate is present in all patients. American Society Of Anesthesiologists difficult airway algorithm makes no mention of pre-oxygenation and it should include a requirement of pre-oxygenation before the induction of general anesthesia.[12-15]

The anaesthesiologists often face difficult intubation and ventilation situations. Prolongation of the safe period after induction and prior to intubation in general anaesthesia is therefore desirable. During preoxygenation, Oxygen replaces the nitrogen from alveoli which increases the body oxygen stores, thus prolonging the safe duration of apnoea after administration of induction anaesthetic agents muscle relaxants.[12,14] thereby, allowing the time to secure the airway safely.

The present study was conducted to compare and study the effects of varying periods of pre-oxygenation, on intraoperative oxygen saturation, time required for recovery of oxygen saturation after intubation and its hemodynamic effect on healthy ASA I and II class of patients, so as to arrive at a value of the optimal duration of pre-oxygenation.

Study conducted by Hamilton and Eastwood[14] and Dillon and Darsie[15] in 1955 found that administration of oxygen prior to administration of induction anaesthesia avoided significant oxygen desaturation and hence they recommended pre-oxygenation in all patients for procedures under general anaesthesia. In 1981, Martin I. Gold et al.[16] found a similar PaO2 after four maximal deep breaths with 100% oxygen taken in 30 seconds compared to that achieved after 5 minutes of tidal volume breathing with 100% oxygen, in the same group of patients. Mark et al, in 1985 found that there was no significant statistical difference between four vital capacity breath technique and 3 minutes tidal volume technique in pregnant patients subjected for caesarean sections. Similarly, in 1989 Goldberg M et al. compared PaO_2 in four vital capacity technique and 3 minute tidal volume technique in morbidly obese individuals and found both techniques equally effective and in year 1994, M. J. Rooney also found four or more vital capacity breath technique of pre-oxygenation to be as reliable as traditional 3 minute tidal volume pre-oxygenation technique.

Several other studies have demonstrated various techniques[17-23] and have used different methods[24-27] to determine the adequacy of pre-oxygenation. Though traditionally 3 mints tidal volume oxygenation is considered the best technique, this technique cannot be used in certain emergency situations where time is valuable. Hence shorter durations of pre-oxygenations like 1-minute and 2-minute vital capacity breath technique becomes the technique of choice in such situations.

Studies done[28,29,19] in the past have concluded that 97-98% of the patients desaturated without pre-oxygenation, during intubation, stressing the need for pre-oxygenation. However most of the techniques used were time consuming and were avoided during emergency situations, where time was scarce. So a less time consuming technique of pre oxygenation would be very useful and valuable in such emergency circumstances.

In our study we found that shorter durations of vital capacity breathe pre-oxygenation technique consumed less times and also increased the duration of safe period before the hypoxia sets in after induction of general anaesthesia, as compared to other pre-oxygenation technique. Results of our study correlate well with other studies[16,17,25,30] where four vital capacity breaths were used as a technique of pre-oxygenation. Hence, we concluded that shorter durations of vital capacity breath pre-oxygenation technique play a very vital role in emergency situations where time is precious.

The differences found in PaO_2 for all preoxygenation techniques have a minor impact on the arterial oxygen saturation, but because of the time differences among the different techniques, venous and tissue oxygen contents may be significantly different.[10,31] Thus, it is possible that the rapid techniques of preoxygenation may result in rapid arterial oxygenation without a significant increase in the tissue oxygen stores and hence result in more rapid haemoglobin desaturation during subsequent apnoea than would a longer period of "traditional" preoxygenation. Previous[10,31] reports have shown that the four-deep-breaths technique is inferior to the 3-min technique[10,31] particularly in pregnant patients,[21] who have decreased FRC and increased basal oxygen requirement, making them more prone to hypoxia. Also, the traditional 3-min technique of preoxygenation may be more suitable for obese patients who already have reduced FRC than the four-breath technique. Russell et al.[32] urged the use of at least 3 min of tidal volume breathing for preoxygenation of all high-risk patients. Our report shows that rapid preoxygenation by one minute and two-minute breathing techniques are equally efficient to three-minute traditional technique of preoxygenation.

CONCLUSION

Rapid preoxygenation by one minute and two-minute normal tidal volume breaths is equally efficient to three-minute traditional technique of preoxygenation in healthy ASA I and ASA II class of patients.

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