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Original Research Article

Evaluation of MAP upon Intubation and Laryngoscopy among ASA I and II Patients

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Abstract

Background: Pulse pressure, which represents the difference between blood pressure systolic and diastolic is the only reliable indication of major artery stiffness. Both hypertensive and normotensive individuals have shown it to predict cardiovascular mortality significantly. Traditional studies on Laryngoscopy and tracheal intubation for anaesthesia have focused exclusively on systolic, diastolic, and mean blood pressure changes.

Aims and Objectives: To determine the effect of MAP due to intubation and Laryngoscopy with Dexmedetomidine among the patients with ASA I and II.

Materials and Methods: A comparative prospective randomized, single-blind, placebo-controlled study was conducted in the operating room of a private teaching hospital offering multispecialty tertiary care. The patients were divided into Group D or Patients in this group received Dexmedetomidine intravenously over 10 minutes at a dose of 0.6 µg/kg body weight diluted to 20 ml of normal saline. Group C or Patients in this group received 20 ml of sterile water intravenously over 10 minutes. From the time the research drug was injected until 10 minutes after intubation, the heart rate and blood pressure (systolic, diastolic, and mean) were monitored every 1 minute, and any difficulties caused by the study drug were reported.

Results: The patients were divided into groups D and C, with 30 patients in each group. The mean age of patients is 42.03 and 43 in group D and group C, respectively. There are 43% males and 57% females in group C, 53% males and 47% females in group D. The mean BMI is 25.23 and 25.5 in group C and D, respectively. 56.67% of patients show ASA grade I and 43.33% show ASA grade II in group D, 50% of patients were seen in each grade I and II in group C.

Conclusion: The study concluded that pulse pressure is a reliable indicator of arterial stiffness. No significant differences were seen among the patients of both groups upon intubation and Laryngoscopy.

Keywords: Dexmedetomidine, Laryngoscopy, ASA I, ASA II.

Introduction

The sole best indicator of major artery stiffness is pulse pressure, the difference between systolic and diastolic blood pressure. It has been demonstrated to be both normotensive and hypertensive people, a significant predictor of cardiovascular mortality. Traditional research on Laryngoscopy & tracheal intubation in anaesthesia has concentrated solely on systolic, diastolic, & mean hypertension changes [4,5]. However, according to recent studies, Diastolic blood pressure may no longer be regarded as a valid predictor of cardiovascular events. Increased peripheral vascular resistance, which raises diastolic pressure, and increased vascular thickness, which lowers diastolic pressure, can contribute to normal diastolic blood pressure levels. These two modifications are mutually exclusive. Therefore, an average diastolic pressure may mask underlying risk factors [1]. These effects might be more accurately reflected by pulse pressure[7]. Traditional blood-pressure readings typically only reflect variations in the stable component of blood pressure, which depends on variations in the balance between ventricular ejection & peripheral arterial resistance. They do not reflect variations in the pulsatile component of hypertension, which depends on interactions between ventricular ejection, the elastic properties of both arteries and the reflection of pulse waves. The pulse intensity can be used to determine the presence of this pulsatile component. There needs to be more information about blood rate in the anaesthetic literature [2,3].

We created prospective observational research to detect changes in blood rate in adult surgery patients and relate these alterations with trends in systolic, diastolic, and mean blood pressure. The study's justification argued that the rise in both diastolic and systolic pressures following tracheal intubation and Laryngoscopy could be excessive and cause either an increase or drop in pulse pressure [4]. Age-related changes in pulse pressure led us to research the impact on two patient populations: young and middle-aged patients. Dysrhythmias, ST segment alterations, and any other brief cardiovascular morbidity have also been noted [5].

Laryngoscopy and tracheal intubation-related reflex sympathetic discharge raise systolic (SAP), diastolic (DAP), and mean arterial (MAP) hypertension, heart rate, and catecholamine levels. Age-related changes in the heart, circulatory system, preload (diastolic filling), ejection fraction (impedance), coronary blood circulation, and autonomic system can alter vascular reactions to tracheal intubation in senior patients [6,7]. Bullington and colleagues first investigated the relationship between age and this reaction in 1989 and discovered that. In contrast, systolic and mean hypertension grew dramatically with age; there was no relationship between age and arterial blood pressure after tracheal intubation [8,9].

The weakening of the hemodynamic response has been the subject of numerous research, but the impact of ageing on responses has yet to be sufficiently explored. The current study's objective was to analyze and compare the hemodynamic changes brought on by Laryngoscopy after tracheal intubation in individuals of three different ages: young adults, middle-aged people, and older adults [10]. Due to the potentially fatal repercussions of unsuccessful endotracheal intubations, unexpectedly difficult intubations remain an essential worry for anesthesiologists. During preoperative examinations, spotting patients with challenging airways is essential. Before the procedure, several tests are conducted to check for possibly challenging intubation. However, which testing has the most predictive power is still being determined [11].

It is well established that endotracheal intubation & direct laryngoscopy airway management techniques during general anaesthesia cause clinical alterations in hemodynamic variables due to hypertension, arrhythmia, and tachycardia brought on by tracheal intubation, catecholamine concentrations change, and a reflex increase in sympathetic activity results [12]. In high-risk individuals, especially those with diastolic dysfunction, cardiovascular disease, or cerebrovascular illnesses, direct Laryngoscopy (DL) causes a noticeable short-term stress response with deleterious consequences just on coronary and cerebral circulation. These issues might be mitigated by employing alternative tools like a fibre optic minimally invasive procedure or light wand [13]. The intubating laryngeal mask airway (ILMA), a new technology with a high success rate that enables tracheal intubation without Laryngoscopy, has been released recently [14].

Material and Methods

Study design

A comparative prospective randomized, single-blind, placebo-controlled study was conducted in the operating room of a private teaching hospital offering multispecialty tertiary care from 2015 to 2017. Randomly divided into two groups were adult patients with an ASA physical status of I or II, who were scheduled for elective surgery under general anaesthesia with Laryngoscopy and intubation.

Group D- Patients in this group received Dexmedetomidine intravenously over 10 minutes at a 0.6 ug/kg body weight diluted to 20 ml of normal saline.

Group C– Patients in this group received 20 ml of sterile water intravenously over 10 minutes.

Baseline measurements of their blood pressure and pulse rate were taken for each patient. Patients in group D received Dexmedetomidine 0.6ug/kg body weight diluted in 20ml of normal saline intravenously over 10 minutes using an infusion syringe pump ten minutes before induction. It was made into a solution containing 5ug/ml of Dexmedetomidine. A volume of the diluted medication in saline was administered using a syringe pump by body weight.

All patients received face mask preoxygenation for three minutes. Patients underwent induction anaesthesia using injections of 2 mg/kg of propofol and 0.5 mg/kg of atracurium. After 3 minutes of 100% oxygen ventilation, a laryngoscopy was performed using an appropriate-sized laryngoscope blade, and the patient was intubated using an appropriate-sized endotracheal tube. Endotracheal tube placement and bilateral chest &epigastric area auscultation were used to confirm intubation. Nitrous oxide and oxygen were combined with 1.5% sevoflurane to maintain anaesthesia. During the 10-minute research period, no surgical stimulation was administered. Atropine 0.6 mg was used intravenously to treat bradycardia (pulse 45/min). Phentermine injections in 3 mg IV increments were used for hypotension (SBP reduction >20% of baseline or 80 mmHg, whichever was lower). Inspired sevoflurane concentration was raised by 0.5% in cases of tachycardia (pulse>140/min) & hypertension (SBP>180mmHg). Following that, these patients were dropped from the trial. ECG, pulse oximeter, non-invasive blood pressure, and capnography were all used to monitor all patients continually. Pantoprazole, 40 mg tablets, was administered orally to all patients the night before surgery and two hours before it.

Randomization: 60 paper chits were produced using the lottery procedure. Dexmedetomidine (group D) was represented by 30 chits and normal saline by 30 chits. In group C, Each chit was combined and then placed in a bowl. The subject had given the option of picking the chit. The subject was not informed of the chit's outcome. A drug or placebo was administered as indicated on the chit. From the time the research drug was injected until 10 minutes after intubation, the heart rate and blood pressure (systolic, diastolic, and mean) were monitored every 1 minute, and any difficulties caused by the study drug were reported.

1) Heart rate (HR)

2) Systolic blood pressure. (SBP)

3) Diastolic blood pressure. (DBP)

4) Mean arterial pressure. (MAP)

Inclusion and Exclusion Criteria

The included patients were scheduled for elective surgery and will receive GA and intubation. The patients with grades I and II ASA, patients with a BMI of 20 and 30, patients of any sex in the age range of 14 to 55 and those who gave written consent were included.

The patients who did not give consent or did not continue with our protocol later on were excluded. Again, the patients with ASA III and IV, patients with BMI>30, patients on a sedative, hypnotics and antidepressant drugs, and those with bronchial asthma, pregnancy, beta-blockers, and difficult intubation, were all excluded.

Statistical analysis

After the collection of the data, it was entered into Microsoft Excel. The data analysis was done using SPSS software version 15. Quantitative data was presented with the help of mean, standard deviation, median, and interquartile range, and comparison among the study group was made with the unpaired T-test.

Ethical approval

The patients were given a thorough explanation of the study by the authors. The patients' permissions have been gotten. The concerned hospital's ethical committee approved the study process before the data collection started.

Results

Table 1 shows that the patients were divided into groups D and C, with 30 patients in each group. The mean age of patients is 42.03 and 43 in group D and group C respectively. There are 43% males and 57% females in group C, 53% males and 47% females in group D. The mean BMI is 25.23 and 25.5 in group C and D, respectively.

Table 1: Distribution of patients' BMI, age, and gender in each study group

Age of the patients											
AGE	**Group D**				**Group C**				**Unpaired T-test**	***p*-value**	**Remarks**
	Mean	**Std. Dev**	**Median**	**IQR**	**Mean**	**SD**	**Median**	**IQR**			
AGE	42.03	13.27	43.5	24.3	43	10.37	45	17.5	-0.314	0.754	NS

Gender distribution					
SEX	**Group C**		**Group D**		
	Number Of Patients	**Percentage**	**Number Of Patients**	**Percentage**	
MALE	13	43	16	53	
FEMALE	17	57	14	47	
TOTAL	30	100	30	100	
p-value	0.4383(NS)				

BMI of the patients							
Group Statistics	**N**	**MEAN BMI**	**Standard Deviation**	**Unpaired T test**	***p*-value**	**Remarks**	
Group C	30	25.23	2.33	0.394	0.695	Not significant	
Group D	30	25.5	2.89				

56.67% of patients show ASA grade I and 43.33% show ASA grade II in group D, 50% of patients were seen in each grade I and II in group C (table 2).

Table 2: Comparison of Patients' ASA Status in Each Study Group

ASA Grade	Group		Total
	Group D (n=30)	Group C (n=30)	
ASA I	17 (56.67)	15 (50)	60
ASA II	13 (43.33)	15 (50)	
Chi-square test	Difference	*p*-value	Association
Pearson Chi-Square	**1**	0.604	NS
Fisher Exact Test		0.796	NS

NS: Not Significant

Table 3 shows no significant difference in the pulse rates between both groups. The pulse rate is slightly higher in T15 in group D and in group C, a slight increase in pulse rate is seen in T0.

Table 3: Comparing the two groups' pulse rates and testing for significance

PULSE RATE (bpm)	Group D	Group C	Unpaired T test	*p*-value	Difference
	Mean±SD	Mean±SD			
T0	81.70±10.69	86.17±8.55	-1.786	0.079	NS
T1	80.07±11.76	84.40±10.15	-1.527	0.132	NS
T3	78.03±12.86	83.10±10.01	-1.769	0.082	NS
T5	76.70±12.86	81.17±13.28	-1.323	0.191	NS
T8	77.10±12.41	81.87±10.93	-1.578	0.12	NS
T10	78.57±12.84	80.67±11.31	-0.672	0.504	NS
T13	81.03±10.63	83.43±11.52	-0.839	0.405	NS
T15	81.97±11.57	84.97±10.40	-1.056	0.295	NS
T18	78.80±10.81	84.83±9.78	-2.266	0.027	NS
T21	79.40±12.41	84.57±8.76	-1.863	0.068	NS
T23	80.03±11.01	85.20±9.88	-1.912	0.061	NS

NS: Not Significant

Table 4 shows no significant differences in responses to Laryngoscopy and intubation regarding mean systolic blood pressure changes. The responses decrease in group D from T0 to T23, with the highest T0 in both groups.

Table 4: This table compares the responses of Group C and Group D after Laryngoscopy and intubation in terms of mean systolic blood pressure changes (mmHg).

Time	Group C	Group D	Unpaired text	*p*-value	Remarks
T0	133.13±15.75	130.60±14.96	-0.639	0.525	NS
T1	130.60±16.70	129.33±13.02	-0.328	0.744	NS
T3	129.03±15.55	128.37±13.51	-0.177	0.860	NS
T5	128.87±15.61	123.93±18.07	-1.132	0.262	NS
T8	128.63±16.26	118.50±14.11	-2.578	0.013	S
T10	126.00±14.95	114.33±12.53	-3.276	0.002	S
T13	124.30±19.71	111.97±14.40	-2.768	0.008	S
T15	125.90±18.84	112.07±16.92	-2.992	0.004	S
T18	122.77±19.45	112.80±15.71	-2.183	0.033	S
T21	120.93±15.94	105.00±10.89	-4.519	0.000	S
T23	123.60±16.44	104.43±12.16	-5.133	0.000	S

NS: Not Significant, S: Significant

Table 5 shows no significant fluctuations in diastolic blood pressure in response to intubation and Laryngoscopy in both groups. A slightly high fluctuation is seen in T15 of group C.

Table 5: Comparison of mean diastolic blood pressure (mmHg) changes in response to Laryngoscopy and intubation between group C and group D

Time	Group C	Group D	Unpaired text	*p*-value	Remarks
T0	79.43±9.76	82.97±12.80	1.202	0.234	NS
T1	79.40±13.80	80.40±15.31	0.266	0.791	NS
T3	78.40±7.75	82.03±11.22	1.459	0.150	NS
T5	78.9±9.31	77.13±11.41	-0.669	0.506	NS
T8	79.43±9.84	75.10±11.63	-1.558	0.125	NS
T10	77.10±6.33	76.97±11.89	-0.054	0.957	NS
T13	79.80±13.99	74.17±10.09	-1.789	0.079	NS
T15	79.50±14.11	74.80±11.93	-1.393	0.169	NS
T18	73.03±13.09	71.47±11.62	-0.490	0.626	NS
T21	74.07±10.49	67.27±10.71	-2..484	0.016	S
T23	76.60±12.22	67.70±11.71	-2.880	0.006	S

NS: Not Significant, S: Significant

Table 6 shows no significant differences ($p>0.05$) in both groups in mean arterial blood pressure fluctuations when Laryngoscopy and intubation are used. Only T8 to T10 was significant ($p<0.05$), while other instances have no significance between the groups.

Table 6: Comparing Group D and Group C's mean arterial blood pressure fluctuations (mmHg) in response to Laryngoscopy and intubation at different time intervals (T0-T23)

Time	Group C	Group D	Unpaired Text	*p*-value	Remarks
T0	93.77±10.58	94.33±11.57	0.197	0.845	NS
T1	93.73±11.21	92.87±12.86	-0.291	0.772	NS
T3	91.70±11.11	92.03±11.42	0.128	0.898	NS
T5	92.40±10.85	88.93±11.89	-1.278	0.206	NS
T8	93.23±10.47	86.60±10.84	-2.366	0.021	S
T10	90.87±9.69	86.13±10.37	-2.043	0.046	S
T13	91.20±9.58	84.60±9.41	-2.071	0.043	S
T15	90.20±10.41	84.67±13.24	-1.498	0.140	NS
T18	86.07±10.36	81.90±12.66	-1.221	0.227	NS
T21	86.50±12.4	77.67±11.39	-2.924	0.0005	S
T23	89.23±12.7	76.47±10.03	-4.263	0.000	S

NS: Not Significant, S: Significant

Discussion

One of the main factors contributing to anaesthesia-related mortality and morbidity is inadequate preservation of the patient's airway. To assess the probability of difficulty ventilated patients in adult patients who appeared to be "normal," this study looked at typical preoperative diagnostic exams [15-17]. The MPT can be utilized as a conventional diagnostic test in preoperative prediction of challenging endotracheal intubations since it has the best accuracy, precision, favourable predictive value, & high sensitivity [15,16].

Comparable to oropharyngeal devices, the insertion with ILMA has indeed been demonstrated to cause the fewest cardiovascular side effects. Studies comparing both hemodynamic & endocrine emotion regulation of endotracheal intubation using an ILM in contrast to DL have shown inconsistent results [18-20]. This study aimed to examine the hemodynamic effects of DL and ILMA in patients undergoing two intubation methods for surgeries under general anaesthesia (SBP, DBP, MAP, HR at baseline, pre-intubation, 1, 3 & 5 min after intubation) [21,22].

We are intubating the supraglottic airway against straight Laryngoscopy to examine the haemodynamic responses to the initiation of treatment. Age, weight, height, and gender differences between the statistically significant groups [19]. We concluded that intubation with an endotracheal intubation laryngeal [21] mask airway is linked with significantly fewer cardiovascular responses than direct laryngoscopic initiation of treatment. Therefore, it can be utilized for individuals with a significant pressure response that is harmful [23].

Hemodynamic alterations brought on by general anaesthesia are a significant issue [24]. To assess the hemodynamic effects of immediate Laryngoscopy (DL) as well as intubating supraglottic airway, we created a prospective, randomized research (ILMA) [25,26]. Compared to catheterization via direct laryngoscope, Laryngoscopy using the intubating supraglottic airway was linked with lower mean arterial pressure & diastolic blood pressure [27]. As a result, this method lessens the hemodynamic reaction to the initiation of treatment [27,28].

General anaesthesia induction was known to cause clinically significant changes in hemodynamic variables, which are likely brought on by direct Laryngoscopy and endotracheal intubation and which seem to be lessened by other airway management techniques [29]. A reflex elevation in sympathetic activity brought on by tracheal intubation may result in hypertension, tachycardia, and arrhythmia [30,31]. It has been established that the stress reaction to tracheal intubation includes a shift in the plasma catecholamine level. The technique of endotracheal intubation & intubation and the use of different airway tools, such as the tracheal tube and the laryngeal mask airway (LMA), all impact how severe the reaction is [26-28,31].

Although these reactions are brief and presumably of little consequence in most anaesthetic patients, they may be hazardous to some patients, especially those with cardiac or cerebrovascular disorders [32]. To examine the hemodynamic effects of inserting an LMA, face mask (FM), or endotracheal tube (ETT) in healthy normotensive anaesthetized patients, we thus undertook a prospective, randomized trial [33,34].

Conclusion

The study concluded that pulse pressure is a reliable indicator of arterial stiffness. The study also concludes that hypertensive and normotensive individuals have shown it to predict cardiovascular mortality significantly. ASA grade I is seen among more patients in group D compared to ASA grade II, and there is an equal number in both ASA grades in group C. ASA grade I is seen among more patients in group D compared to ASA grade II, and there is an equal number in both ASA grades in group C. there is no significant difference in the pulse rates between both groups. The pulse rate is slightly higher in T15 in group D and in group C, a slight increase in pulse rate is seen in T0. No significant differences are seen in responses to Laryngoscopy and intubation regarding mean systolic blood pressure changes. The responses decrease in group D from T0 to T23, with the highest T0 in both groups. A slightly high fluctuation is seen in T15 of group C. Both groups have no significant differences in fluctuations of mean arterial blood pressure when Laryngoscopy and intubation are used. However, the study has analyzed only a single dose of Dexmedetomidine, and analysis still needs to be done with other dosages. The effects of various dosages were not considered in this study. Overall, this study brought forward the findings which would contribute clinically to the management of intubation and Laryngoscopy of patients with ASA I and II.

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