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RESEARCH ARTICLE

A COMPARATIVE STUDY OF 10% XYLOCAINE SPRAY AND NITROGLYCERINE SPRAY ON CARDIOVASCULAR RESPONSES TO LARYNGOSCOPY AND INTUBATION UNDER GENERAL ANAESTHESIA

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Abstract

The procedure of laryngoscopy and intubation is an integral part of modern-day balanced anaesthesia. It is also the most delicate phase in general anaesthesia. It is performed for most of the major and some minor surgical procedures. The procedure of direct laryngoscopy and intubation is associated with significant hemodynamic changes such as increase in heart rate, arterial pressure and dysrhythmias in up to 90% of the patients. These changes are sometimes fatal if not taken care in time. Various intravenous, sublingual or locally effecting drugs have been used to blunt these adverse effects. Xylocaine 10% spray locally at laryngotracheal mucosa and 0.8mg nitroglycerine intranasal spray is an effective procedure to reduce the exaggerated cardiovascular response. Among these xylocaine is ideal for attenuating the cardiovascular response to laryngoscopy and intubation under general anaesthesia.

Introduction:-

The procedure of direct laryngoscopy and intubation is associated with significant hemodynamic changes such as increase in heart rate, arterial pressure and dysrhythmias in up to 90% of the patients (REID LC et al 1940). Unfortunately, these are often overlooked during clinical anaesthesia as the anaesthesiologist may be so engaged in other technical aspects of intubation that he has little opportunity to note any abnormal circulatory reaction unless it is severe or prolonged.

This increase in pulse rate and blood pressure are usually transitory, variable and unpredictable. Transient hypertension and tachycardia are probably of no consequence in healthy individuals but some patients require careful hemodynamic control during anaesthesia and intubation of the trachea. Mostly these are patient with known or suspected ischemic heart disease, recent myocardial infarction and those with hypertension. The complications that may occur because of this sudden rise in blood pressure include left ventricular failure (Denson J S & Joseph, S

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I, 1954), myocardial ischemia (Katz R L, & Bigges J T, 1917), cerebral haemorrhage (Forbes A M, Z Dally, F H,1970) and even sudden death (Dwyers C S, Stront W G , 1953).

These cardiovascular changes had initially been ascribed to be due to vago-vagal reflex or due to stimulation of cardiac response. Subsequently, it has been postulated that these reflexes are mediated by increased sympathetic nervous system activity. This is reflected by an increase in the level of circulating catecholamines especially noradrenalin. The stimulation of the sympathetic system occurs due to laryngoscope pressing the base of the tongue or lifting the epiglottis thus stimulating the mechanoreceptors in the proximal part of the trachea. Over the period, various approaches have been advocated ranging from minimizing the duration of laryngoscopy (to less than 15 seconds) and the use of various pharmacological agents to reduce the extent of these potentially harmful responses (Abou-Madi, M Kessler, and Yacoub O, 1975).

Lidocaine (xylocaine) is the oldest and most widely used drug to attenuate pharyngeal and laryngeal reflexes (Abon 1977). It is particularly suitable for this purpose because of its rapid onset and short duration of action which is compatible with the duration of this pressor response. It is used topically as a laryngotracheal spray or by intravenous route.

Other drugs that have been postulated for attenuation of these pressor responses include intravenous narcotics like Fentanyl, Alfentanil (Kautto U M, 1982) and various antihypertensive agents such as beta-blockers (PYRS PROBERS C et al 1973), ganglion blockers (SEIDLECKI 1975), central sympatholytics like clonidine (ORKO et al 1987), calcium channel blockers, ACE inhibitors and peripheral vasodilators like nitroprusside and hydralazine (CURRAN J 1975, Kautto U.M. &Heinonen J.1982). None of these pharmacological approaches has proved entirely satisfactory because the response may not be completely blocked or the method itself carries some additional risk. The agent used may have too long action or have unfeasible side effects.

There is a continuous search for an ideal agent that could reduce the adverse cardiovascular response during laryngoscopy and intubation. We did this study with 10% xylocaine spray at laryngotracheal mucosa and topical 0.8mg nitroglycerine intranasal spray in healthy ASA grade I& II patients in our hospital undergoing different surgical procedures under G.A.

Aims and Objective:-

1. To evaluate the efficacy of 100 mg. of 10% topical laryngotracheal xylocaine spray and topical 0.8mg nitroglycerine intranasal spray for attenuating stress response during laryngoscopy and intubation
2. To observe the untoward reaction and adverse effects during these procedures.

Material and Method:-

The study was conducted in the Department of Anaesthesiology and Critical Care, Rama Medical College Hospital and Research Centre, NH-24, Pilkhuwa, Hapur from 1st January 2018 to June 2019. Due approval of the hospital ethics committee on 60 normotensive ASA Grade I & II patients was taken.

All patients underwent a thorough pre-anaesthetic check-ups comprising of general physical examination, systemic examination and routine investigations. Other investigations were conducted whenever required.

Following investigations were routinely performed.

- Haemoglobin %
- Blood Sugar
- Blood Urea
- TLC, DLC, ESR
- BT/CT
- Blood grouping
- E.C.G
- Urine R/M
- RFT
- LFT
- Chest X-Ray

Selected patients were of both sexes, 20-60 years old and of ASA Grade I & II only.

Exclusion Criteria:
Following patients were not included in the study:-
1. Uncooperative patients.
2. The patient suffering from renal, hepatic or psychiatric illness.
3. Patients with a history of hypertension, diabetes mellitus, bronchial asthma.
4. Patient on medication with any cardiovascular diseases.
5. Patient with addiction to any drugs particularly narcotics.

Methodology:-

After obtaining informed consent patients were randomly divided into 3 groups (A, B & C) of 20 each.

Pre-medication:
Uniform premedication was given in all groups with tablet Alprazolam 0.25 mg H.S. on the night before surgery and with Inj Pethidine 1 mg /kg, Inj Phenergan 0.5 mg/kg I.M. 45 min. before induction of general anaesthesia.

Group A:
Patient in this group only received the premedication and formed the control group.

Group B:
Patients in this group were given 100 mg topical 10% xylocaine spray over laryngotracheal mucosa, (each puff of which delivers 10 mg of the drug). Patients received a total dose of 100 mg. Half of which i.e. 50 mg. (5 puffs) sprayed over laryngotracheal mucosa 10-15 minutes before induction by using a tongue depressor and the rest (5 puffs containing 50 mg. of drug) while doing laryngoscopy and intubation.

Group B:
Patients in this group received topical nitroglycerine in the form of an intranasal spray in a dose of 0.8 mg. 2 minutes before induction. The drug was administered as 2 puffs of nitroglycerine spray, each metered dose of which delivers 0.4 mg. nitroglycerine.

Procedure of anaesthesia:
Baseline parameters were recorded in the operation room. The patient was pre-oxygenated for 3 minutes with 100% oxygen. Induction was done with inj. thiopentone sodium (3-5 mg/kg) I/V followed by injection succinylcholine (1.5 mg / kg) I/V. Endotracheal intubation was carried out with optimal size endotracheal tube and maintained with oxygen, nitrous oxide and injection vecuronium (0.08 to 0.1 mg /kg) I/V with Bain`s or closed circuit. At the end of the surgery, reversal was done with injection atropine 0.02mg /kg and injection neostigmine 0.05mg / kg I/V.

Following parameters were observed for the study:
1. Pulse rate (PR)
2. Blood Pressure – Systolic(SBP) and Diastolic (DBP)
3. Mean Arterial Pressure (MAP)
4. SPO_2 %
5. E.C.G.

The readings were recorded at the following intervals:
1. Just before giving drugs (baseline values, BV)
2. After giving drugs (before induction, BI)
3. After induction, (AI)
4. Just after laryngoscopy and intubation, (L&I)
5. Post intubation at 1^{st} (I_1), 3^{rd} (I_3), 5th (I_5), 10^{th} (I_{10}), 15^{th} (I_{15}) and 30^{th} (I_{30}) minute intervals.
6. Adverse effects if any were recorded. All the above informations were recorded in a proforma.

Analysis of data:
After completion of the study observations were tabulated qualitatively and quantitatively and analysed using proper statistical methods.

Observations:-

The present study was conducted in 60 patients of both sexes, age group 20-60 yrs., scheduled for elective surgery under general anaesthesia at Rama Medical College Hospital & Research Centre, NH-24, Pilkhuwa,Hapur.

Table no. 1:- Distribution of patients.

S. No.	Group	No. Of patient	Dose of drug
1	A	20	control group
2	B	20	10% topical xylocaine spray
3	C	20	nitroglycerine spray

Table no. 2:- Age distribution.

S. No	Age group	Group A	Group B	Group C	Total
1	20-30	10	6	9	25
2	31-40	8	9	5	22
3	41-50	1	4	5	10
4	51-60	1	1	1	3
	Total	20	20	20	60

Table no. 3:- Sex distribution.

S. No.	Group	No. of pat.	Sex	
			Male	Female
1	A	20	4	16
2	B	20	1	19
3	C	20	6	14
	Total	60	11	49

Table no. 4:- Weight distribution.

S. No	Weight	Group A	Group B	Group C	Total
1	30-40	3	3	4	10
2	41-50	8	4	9	21
3	51-60	5	6	4	15
4	> 61	4	7	3	14
	Total	20	20	20	60

Table no. 5:- Mean pulse rate in all groups at relevant recording time.

Group		**B V**	**V I**	**A I**	**L& I**	**I_1**	**I_3**	**I_5**	**I_{10}**	**I_{15}**	**I_{30}**
A(control)	**Mean**	87.05	87.05	99.95	103.65	119.65	109.05	100.40	98.85	89.75	87.55
	S.D	7.69	7.69	5.51	5.82	9.03	9.81	5.91	5.40	5.50	5.61
B(10% topical xylocaine spray)	**Mean**	103.80	103.30	102.40	102.65	110.35	103.25	101.00	101.05	100.55	101.05
	S.D	9.09	8.01	9.14	9.12	5.75	6.57	5.55	4.42	4.35	4.15
C(nitroglycerine Spray)	**Mean**	97.90	99.20	98.00	104.10	109.50	100.90	96.90	96.60	94.80	97.45
	S.D	14.73	14.12	25.23	12.34	11.57	11.52	12.22	11.70	12.08	14.27

Table no. 6:- Statistical analysis of mean pulse rate in all groups at relevant recording time and their comparison with baseline value

Group		B.V.-B.I	B.V-A.I	B.V-L&I	B.V-I_1	B.V-I_3	B.V-I_5	B.V-I_{10}	B.V-I_{15}	B.V-I_{30}
A(control)	P. Value	--	<0.00	<0.00	<0.00	<0.00	<0.05	<0.05	>0.05	>0.05
	Significance	--	H.S.	H.S.	H.S.	H.S.	S.	S.	N.S.	N.S.
B(10% topical xylocaine spray)	P. Value	>0.05	>0.05	>0.05	<0.05	>0.05	>0.05	>0.05	>0.05	>0.05
	Significance	N.S.	N.S	N.s.	S.	N.S.	N.S.	N.S.	N.S.	N.S.
C(nitroglycerine Spray)	P. Value	> 0.05	> 0.05	<0.00	<0.00	< 0.05	> 0.05	> 0.05	> 0.05	> 0.05
	Significance	N.S.	N.S	H.S.	H.S.	S.	N.S	N.S	N.S	N.S

S=significant, N.S. = non significant, H.S. = highly significant

In group A (control) the rise in mean pulse rate was statistically highly significant after induction, at laryngoscopy & intubation and 1 & 3 minutes post-intubation and it was significant at 5 & 10 minutes post-intubation.

In group B (10% lignocaine spray) the statistically non-significant changes from basal value were observed at all recording interval except at 1 minute post-intubation when a significant increase in the mean pulse rate was observed.

In group C (nitroglycerine spray) the increase in mean pulse rate was statistically highly significant on laryngoscopy and intubation, at1 minute post-intubation and was significant at 3 minutes post-intubation, while at other intervals the changes were non-significant.

Table no. 7:- Mean systolic blood pressure in all groups at relevant recording time

Group		B.V.	B.I.	A.I.	L& I	I_1	I_3	I_5	I_{10}	I_{15}	I_{30}
A(control)	Mean	128.80	128.80	127.30	139.40	165.40	145.00	134.30	130.30	129.10	127.70
	S.D.	10.29	10.29	13.30	11.46	16.44	8.17	9.61	8.74	8.32	9.59
B(10% topical xylocaine spray)	Mean	132.70	128.00	118.10	131.50	137.90	130.90	128.00	127.10	128.70	131.40
	S.D.	11.11	8.31	11.65	12.22	12.18	7.35	8.31	7.72	8.16	7.76
C(nitroglycerine Spray)	Mean	136.50	136.00	126.30	134.30	148.80	138.80	134.90	134.00	134.70	135.20
	S.D	8.58	11.37	9.80	8.95	9.99	10.07	6.03	5.31	7.12	7.77

Mean systolic blood pressure

In group A (control) the rise in mean systolic blood pressure was statistically highly significant after laryngoscopy and intubation at 1min. Post-intubation and significant at 3 & 5 min. post-intubation.

In group B (10% xylocaine spray) statistically significant fall in mean systolic blood pressure was seen after induction while the change in the rest of the values was non-insignificant when compared with the basal value.
In group C (nitroglycerine spray) the fall in mean systolic blood pressure after induction and at 1-minute post-intubation respectively were both statistically highly significant.

Table no. 8:- Mean diastolic blood pressure in all groups at relevant recording time

Group		B.v.	B.i.	A.i.	L & i	I_1	I_3	I_5	I_{10}	I_{15}	I_{30}
A(control)	Mean	77.50	77.50	76.50	81.95	96.40	87.50	81.70	79.40	76.30	75.30
	S.d	6.39	6.39	5.91	9.62	8.62	3.78	6.03	5.73	4.91	4.65
B(10% topical xylocaine spray)	Mean	78.20	77.20	75.80	81.60	84.50	78.20	76.20	79.10	79.80	79.40
	S.d	7.08	6.47	7.97	8.52	7.05	6.71	5.84	6.44	5.69	5.88
C(nitroglycerine Spray)	Mean	81.50	83.40	77.70	80.10	90.10	84.80	80.30	79.10	83.60	83.00
	S.d	5.39	5.70	4.99	5.33	5.29	6.07	5.36	4.42	5.13	4.47

Mean diastolic blood pressure:

In group A (control) there was a statistically highly significant increase in the mean diastolic blood pressure at 1 & 3 minutes post-intubation and significant increase after laryngoscopy and intubation and at 5 minutes post-intubation.

In group B (10% xylocaine spray) a statistically significant increase in mean diastolic blood pressure was observed only at 1-minute post-intubation.

In group C (nitroglycerine spray) there was a significant fall in mean diastolic blood pressure after induction and at 3 minutes post-intubation respectively, while at 1-minute post-intubation the increase was highly significant as compared with the baseline value.

Table no. 9:- Mean of arterial blood pressure in all groups at Relevant recording time

Group		B.V.	B.I.	A.I.	L&I	I_1	I_3	I_5	I_{10}	I_{15}	I_{30}
A(control)	Mean	94.70	94.70	93.50	101.10	119.50	106.60	99.25	96.45	93.95	92.75
	S.D.	6.83	6.83	7.19	9.54	10.25	4.03	5.73	5.38	5.16	5.77
B(10% topical xylocaine spray)	Mean	96.35	94.05	89.90	98.30	102.20	95.80	93.40	95.00	96.15	96.75
	S.D.	7.19	5.78	8.32	9.14	7.93	6.41	6.42	5.53	5.63	5.90
C (nitroglycerine Spray)	Mean	99.80	100.85	93.95	98.30	109.65	102.65	98.45	97.40	100.65	100.45
	S.D.	5.28	5.82	5.92	5.69	5.70	5.97	5.18	4.25	4.31	4.77

In group A an increase in mean arterial pressure from basal was observed which was statistically significant at laryngoscopy & intubation, 5 min post-intubation and highly significant at 1 & 3 min post-intubation.

In group B there was a statistically non-significant decrease in mean arterial blood pressure after induction and a non-significant increase at 1 min post-intubation.
In group C there was a statistically highly significant decrease in mean arterial blood pressure after induction and a significant increase at 1 & 3-minute post-intubation respectively.

ECG changes -Sinus tachycardia was seen more in group A but less in group B & C cases and no other abnormality was seen in ECG throughout the study.

SpO_2 changes
In all the cases SpO_2 was 95 % or more throughout the study.

Complication
No adverse effect of any drug and no complication was observed in the study.

Discussion:-

The most vital element in providing safe anesthesia is the maintenance of a patent airway. Laryngoscopy and endotracheal intubation is the routinely performed procedure to ensure an intact airway and hence form an integral part of modern-day balanced anesthesia.

The procedure of laryngoscopy and intubation is associated with significant hemodynamic changes and attenuation of these has attracted the attention of anaesthetists for more than half a decade. The reason for this is an occasional sudden death following intubation, tachycardia, hypertension and arrhythmias. These cardiovascular changes though transient may be potentially dangerous especially in hypertensive patients and in patients with coronary and cerebral vascular insufficiency. Over the period of time various approaches have been advocated, ranging from minimizing the duration of laryngoscopy to less than 15 seconds to the use of various pharmacological agents but none is ideal alone so far.

Therefore the pursuit of an ideal agent for the suppression of the cardiovascular response to intubation without altering the normal physiology continues.

The aim of the present study was to compare the hemodynamic effects of 10% xylocaine spray and 0.8mg. Topical nitroglycerine intranasal spray in healthy normotensive patients during general anesthesia and to study the hemodynamic and electrocardiographic responses to laryngoscopy and tracheal intubation.

Group A (control)
Just after laryngoscopy and intubation, there was a highly significant increase in PR, SBP,DBP & MAP. At 1 min post-intubation, a highly significant increase was observed in all the parameters from the basal value.

At 3 min post-intubation, there was a highly significant increase in PR, DBP & MAP, though a decrease was seen in the SBP. It was still significantly higher than the basal value. At 5 minutes post-intubation, a gradual decline was seen in all the parameters with SBP, DBP and MAP reaching the basal value by 10 minutes post-intubation and PR by 15 minutes post-intubation.

Group B (10% xylocaine spray)
In the present study after pre-treatment with 10% xylocaine spray 100 mg. Nonsignificant fall was observed in PR, SBP, DBP and MAP.

Just after laryngoscopy and intubation non-significant rise was observed in DBP and MAP when compared with the baseline. At 1 minute after laryngoscopy and intubation, a statistically non- significant increase in the mean systolic

blood pressure was observed. There was a non-significant change from the baseline in the rest of the reading obtained at further recording intervals.

Group C (nitroglycerine spray)
After induction, a statistically non-significant increase was observed in PR while there was a highly significant decrease in SBP & MAP and a significant decrease in DBP.

Just after laryngoscopy and intubation, there was a statistically highly significant increase in PR and a steady rise in the rest of parameters which was statistically non-significant.
At 1 minute after laryngoscopy and intubation statistically highly significant changes occurred in all the parameters from the baseline value.

At 3 minutes post-intubation PR, DBP and MAP remained above the basal value and were statistically significant while SBP increased from the baseline and it was non-significant.

At 5 minutes post-intubation, all the parameters had reached the baseline value and non-significant changes were observed in all the recorded parameters.

Summary and Conclusion:-

The present study was carried out in the department of anesthesiology and critical care of Rama Medical College Hospital & Research Centre, Pilkhuwa, Hapur, to assess and compare the efficacy of 100 mg. topical 10% xylocaine spray and topical 0.8mg nitroglycerine intranasal spray for attenuation of cardiovascular stress responses to laryngoscopy and intubation.

In the present study following conclusions are drawn:

1. Laryngoscopy and intubation are associated with significant increases in pulse rate, blood pressure, mean arterial pressure and sinus tachycardia. The maximum increases in parameters occur at 1 min post-intubation with values returning to baseline at 10 min post-intubation in case of pulse rate and at 5 minutes post-intubation in case of systolic, diastolic and mean arterial pressure.
2. 10% xylocaine spray effectively attenuate ESR, blood urea, the hypertensive effect of the cardiovascular system and tachycardia response to laryngoscopy and intubation.
3. Xylocaine spray provides consistent and reliable protection from increases in pulse rate, blood pressure, mean arterial pressure and blunts the cardiovascular response to laryngoscopy and intubation under GA without any complication when used in proper doses and time.
4. Nitroglycerine spray administered intranasal 2 minutes before induction effectively attenuate the hypertensive effect but not the tachycardiac response of the cardiovascular system to laryngoscopy and intubation.
5. The studied drugs are helpful in attenuating the hypertensive effect of the cardiovascular system to laryngoscopy and intubation but nitroglycerine is not very effective in attenuating the tachycardia response while xylocaine is the ideal drug when used in proper dosage and time.

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