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"COMPARATIVE EVALUATION OF DEXMEDETOMIDINE AND FENTANYL TO ATTENUATE HEMODYNAMIC RESPONSE TO LARYNGOSCOPY AND INTUBATION."

Anaesthesiology

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ABSTRACT

Introduction- Endotracheal intubation includes laryngoscopy and intubation, which often evokes cardiovascular responses characterized by increase in arterial pressure, changes in heart rate and disturbance in cardiac rhythm, which are transient variable and unpredictable.The present study was conducted and evaluated to compare the efficacy of dexmedetomidine and fentanyl in attenuating sympathoadrenal response which includes heart rate and arterial blood pressure changes during tracheal intubation. **Methods-** 100 adult patients of either sex belonging to ASA grade I, II, III belonging to age riagroup 18 to 80 years were posted for elective surgery under general anesthesia. . Total 100 adult patients were randomly divided into 2 groups with 50 patients in each group. Group D-Inj Dexmedetomidine 1mcg/kg 10minutes before laryngoscopy. Group F-Inj Fentanyl 2 mcg/kg 10 minutes before laryngoscopy .In predetermined time heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure were observed and compared in both groups. **Results-**There was rise in heart rate, systolic blood pressure, diastolic blood pressure mean arterial pressure immediately after intubation, 1min.2min, 3min, 5min and 10 min after intubation **Conclusion-** Dexmedetomidine 1mcg/kg iv produces more favourable hemodynamic response while fentanyl 2mcg/kg less effective for attenuating pressor response to laryngoscopy and endotracheal intubation.

KEYWORDS

Dexmedetomidine, fentanyl, laryngoscopy, intubation.

INTRODUCTION-

Endotracheal intubation is translaryngeal placement of tube in trachea via nose or mouth. Endotracheal intubation includes laryngoscopy and intubation, which often evokes cardiovascular responses characterized by increase in arterial pressure, changes in heart rate and disturbance in cardiac rhythm,. Endotracheal intubation is a noxious stimulus, which can be sympathetic and parasympathetic. Parasympathetic response is seen in pediatric population, while in adult's sympathetic response predominant which may be result of increase in catecholamine activity. Occurrence of pressor response to tracheal intubation is due to reflex sympathoadrenal stimulation following laryngoscopy and tracheal intubation. There is consistent increase in plasma concentration of norepinephrine following tracheal intubation.

Contributory Factors:

Anxiety, atropine premedication, reflex baroreceptor effect following fall of blood pressure after induction of anaesthesia. A need is felt among the anaesthesiologist for desired avaliblity of a drug that effectively suppresses responses to obnoxious stimuli with maximum safety margin. Newer alpha 2 adrenergic agonist, dexmedetomidine has multidimensional features. It has partial agonistic activity and is known to decrease plasma catecholamine level and suppress the release of catecholamine. It possess anxiolytic, sedative, analgesic and sympatholytic properties. Fentanyl is an opioid μ receptor agonist and is used in clinical practice as sedative/analgesic. Dexmedetomidine and Fentanyl both have sympatholytic analgesic and sedative properties but unlike fentanyl, dexmedetomidine has been reported to induce sedation without respiratory depression. The present study was conducted and evaluated to compare the efficacy of dexmedetomidine and fentanyl in attenuating sympathoadrenal response which includes heart rate and arterial blood pressure changes during intubation.

MATERIALS AND METHODOLOGY-

In our study 100 adult patients of either sex belonging to ASA grade I, II and III were selected. They were posted for elective surgery under general anesthesia.After obtaining institutional ethical committee approval, written informed consent was obtained before starting the study.Total 100 adult patients were randomly and divided into 2 groups with 50 patients in each group. Group D-Inj Dexmedetomidine 1mcg/kg 10minutes before laryngoscopy.Group F-Inj Fentanyl 2 mcg/kg 10 minutes before laryngoscopy.Study type-Prospective interventional randomized double blind study.

Inclusion Criteria:

Age between 18 to 80 years, both genders, ASA physical status 1,2 and 3,elective surgery under general anaesthesia.

Exclusion Criteria:

Patient refusal, ASA physical status 4 and 5,patient with history of hypersensitivity to dexmedetomidine and fentanyl, mouth opening<2.5 cm, mallampatti grade 3 and 4,patients with cardiovascular diseases like ischaemic heart disease, hypertension, bronchial asthama, existence of considerable pathology in pharynx and larynx, patients with GERD

Pre Anesthetic Check Up:

Each patient had a pre anesthetic checkup which included:
1. Any significant present and past medical/surgical history
2. Physical examination
3. Vital parameters like BP, pulse, temperature & respiratory rate

All routine and specific investigations (ECG, CBC, chest - x-ray, RFT, LFT, serum electrolytes ,PT/INR and APTT). Informed consent of the patients for the study was taken. An independent assistant randomly assigned a particular group to the patients.

MATERIALS:

Anesthesia Work Station, Monitors:
NIBP monitor, pulse oximeter, ECG, I.V. cannula (18GI.V. infusion set, inj. Ringer lactate, colloids Laryngoscope with blades, ET tubes, airway, masks, Bain's circuit.

Anesthetic agents:
Propofol, Succinylcholine, Vecuronium, Glycopyrrolate, Fentanyl Midazolam, Ondansetron, Dexmedetomidine, Lignocaine.

Emergency Drugs:
Adrenaline, Atropine, Ephedrine, Dopamine, Hydrocortisone Sodium succinate, Mephentermine, Dexamethasone, Deriphylline, Furosemide, Calcium gluconate, Noradrenaline, Dobutamine, Sodium bicarbonate.

Miscellaneous:
Defibrillator, Suction apparatus, Watch, Adhesive tape, Stethoscope, Apron, Surgical gloves.

PROCEDURE:

Thorough pre-anesthetic checkup (PAC) a day before the surgery was done as per the protocol of our department and written and informed consent for participation in study was taken.

Anaesthesia Technique

In the operation theatre after placing the monitors baseline parameters were noted, (PR,SBP,DBP,MAP ,Sp02, ECG) and an iv access was secured. Patient was given premedication with injection ondansetron 0.15mg/kg, injection dexmedetomidine 1mcg/kg to group D and inj fentanyl 2mcg/kg to group F and Glycopyrrolate 0.004 mg/kg. Patient was preoxygenated with 100% oxygen for 3 mintues. Injection dexmedetomidine and inj fentanyl were given to respective groups 10 min prior to laryngoscopy.Anesthesia was induced with injection propofol 2mg/kg iv After induction of anaesthesia hemodynamic parameters will be recorded. Later after 60 seconds after loss of consciousness which will be confirmed inability to respond to verbal commands and loss of eyelash reflex, injection succinylcholine 2mg/kg will be given. Laryngoscopy and endotracheal intubation will be done. Duration of laryngoscopy will be less than 10 seconds.Proper placement of tube will be confirmed by capnography and bilateral auscultation of chest. Anesthesia was maintained with 0.2-2% sevofluorane and 50% N20 in oxygen along with intermittent bolus dose of vecuronium 0.02mg/kg as required throughout the surgery. Intra - operative monitoring included HR, SBP, DBP, MAP, SpO2 and ECG (lead II) was monitored. The BP was recorded immediately before the induction of anesthesia and every five minutes during anesthesia using automated noninvasive BP monitor. The ECG was monitored by ECG. At the end of surgery sevofluorane was switched off and we waited for return. Residual neuromuscular blockade will be antagonized with inj glycopyrolate 8mcg/kg bolus and neostigmine 0.05mg/kg iv. Extubation will be performed when respiration will be adequate and patient will be able to obey verbal commands.

Monitoring-

Heart rate,systolic blood pressure, diastolic blood pressure, mean arterial pressure, pulse oximetry, respiratory rate. All parameters were recorded at following stages baseline,10 minutes after premedication, after intubation,1 minute after intubation,2 minute after intubation, 3 minutes after intubation, 5 minutes after intubation, 10 minutes after intubation.

DATA AND STATISTICAL ANALYSIS

Sampling:

RANDOMISATION – Patients were divided into 2 groups by random chit method.

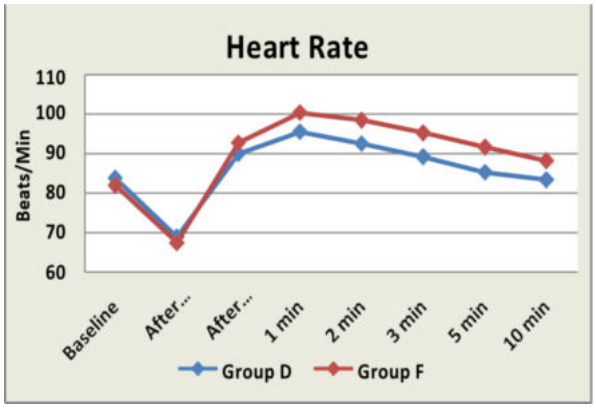
DOUBLE BLINDING-. The anesthetist who gave the medicine was different from the anesthetist who recorded study variable. Patients were told that some drug for maintaining hemodynamics was given to them.

ANALYSIS OF DATA:

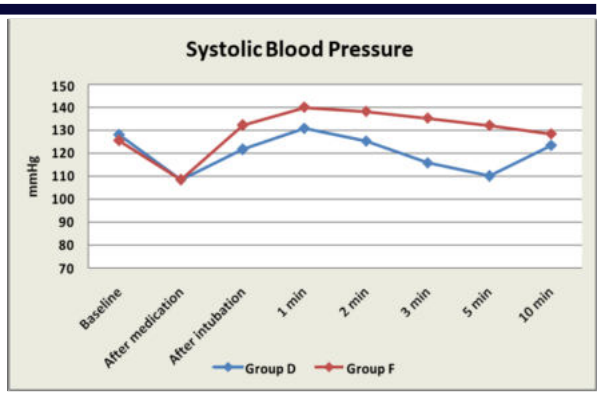
Data was expressed as mean values ± standard deviation (SD). Quantitative data was analyzed using paired t-test and qualitative by chi square test. Statistical calculations were carried out using Microsoft Office Excel 2017 and IBM SPSS version 22 was used for most analysis. Changes in hemodynamic variables from baseline and a comparison of means were analyzed by paired test for each time interval. p-value <0.05 was considered statistically significant and p-value >0.05 was considered non-significant

RESULT-

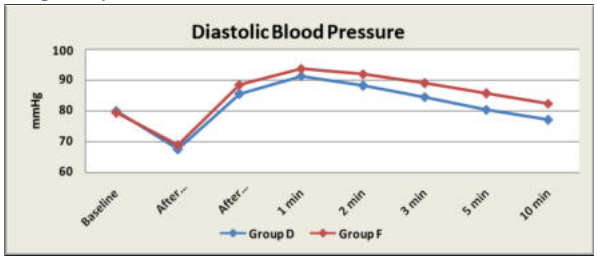
Both the groups are comparable in age, sex and ASA grading. No significant differences have been found in these parameters.



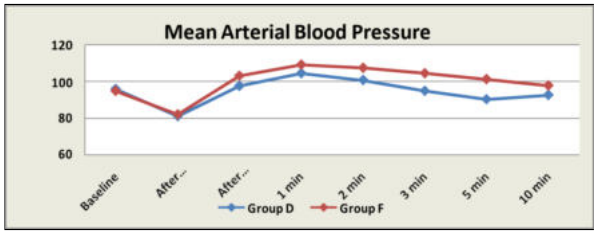
Graph1: Heart Rate Wise Distribution



Graph 2: Systolic Blood Pressure Wise Distribution



Graph 3: Diastolic Blood Pressure Wise Distribution



Graph 4: Mean Arterial Blood Pressure Wise Distribution

As shown in the above graphs and table there is no statistical difference was observed in baseline heart rate, systolic blood pressure, diastolic blood pressure of both the groups. There is rise in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure in group F compared to group D immediately after intubation, at 1min, 2min, 3min, 5min and 10 min after intubation which is statistically significant with p value less than 0.05.No statistical difference was observed between both the groups for spo2 and respiratory rate.

DISCUSSION

Hemodynamic stress response to laryngoscopy and endotracheal intubation has always become a challenge for anaesthetist. It manifests in the form of hypertension, tachycardia, arrhythmias. The adverse cardiovascular changes and catecholamine discharge seen during laryngoscopy and tracheal intubation appear in two phases. The effects of laryngoscopy should be distinguished from effects seen while endotracheal tube is placed through trachea. Laryngoscopy alone without intubation causes supraglottic stimulus in which both SBP and DBP increased compared to heart rate.Endotracheal intubation creates an extra cardiovascular response and catecholamine discharge due to infraglottic stimulus.Stress response increases at this stage and both SBP and DBP increase by 36 % to 46%. Heart rate increases more than 20% with tracheal intubation in contrast to laryngoscopy.[1,,2]

Typically the response of increase in blood pressure starts within 15 seconds of laryngoscopy and peaks in 30 seconds to 1minute.Its returns to control level within 5 to 10 minute .This physiology helps in timing of administration of drug and the peak effect used for attenuation of hemodynamic response, should correspond to those of hemodynamic response. [3]

Dexmedetomidine as alpha agonist inhibit the release of catecholamines(nor epinephrine) from the sympathetic nerve terminals by augmentation of vasoconstrictive effect. Sedation, analgesia, ,sympatholytic, anxiolytic and blunting of hemodynamic responses by administration of dexmedetomidine are exclusively mediated by activation of alpha 2 receptors located in synaptic

terminal in central nervous system leading to reduced neuronal activity and augmentation of vagal activity.

Low doses of fentanyl 1 to 2 mcg.kg iv are given to provide analgesia.Fentanyl 2 to 20 mcg/kg iv is administered as an adjuvant to inhaled anaesthetics in an attempt to blunt circulatory responses direct laryngoscopy and intubation and sudden changes in level of surgical stimulation.

In our study heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure in both the groups were recorded after premedication, immediately after intubation ,1min, 2min,.3min,5min and 10min after intubation. All the parameters mentioned above in both the groups were significant immediately after intubation, after 1min,2min,3min,5min and 10 min after intubation.(p value<0.05). Maximum rise was seen after 1minute of intubation in both the groups, but in group D vital parameters returned to the baseline value after 10 min of intubation .As compared to group D vital parameters in group F remained persistently elevated from baseline even after 10 minutes of intubation.These findings were similar to those in other studies conducted in other parts of the world.

Sandeep Kothari et al in 2018 carried out a similar study.Vital parameters were compared at 1min, 2min,5 and 10 min after intubation. Dexmdetomidine showed greater suppression of heart rate compared to fentanyl which was statistically significant.[4]

Nidhi Patel et al in 2015 carried a similar comparative study between dexmedetomidine and fentanyl for suppressing hemodynamic response to laryngoscopy and intubation. It showed that rise in systolic blood pressure was more in fentanyl group compared to dexmedetomidine group which was statistically significant.[5]

CONCLUSION-

Effects of fentanyl and dexmedetomidine on heart rate, blood pressure on laryngoscopy and endotracheal intubation have been compared.From our results between two drugs under study dexmedetomidine 1mcg/kg iv is satisfactory and produces more favourable hemodynamic response while fentanyl 2mcg/kg less effective for attenuating pressor response to laryngoscopy and endotracheal intubation. .Both these drugs are safe in elective surgeries.

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