EFFICACY OF NALBUPHINE IN PREVENTING HAEMODYNAMIC RESPONSE TO LARYNGOSCOPY AND INTUBATION

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ABSTRACT

Objective: To determine the efficacy of nalbuphine in preventing increase in heart rate and mean arterial pressure in response to laryngoscopy and tracheal intubation.

Methodology: This double blind randomized controlled trial was conducted on 100 ASA (American Society of Anesthesiologists) grade I–II patients scheduled for general anaesthesia. Patients were randomly allocated to receive either saline (group I, control group, n=50) or nalbuphine 0.2 mg kg-1 (group II, study group, n=50) as a bolus dose 5 minutes before laryngoscopy. Anaesthesia was then induced with propofol (2mg kg-1) and atracurium (0.6mg kg-1) and orotracheal intubation was then performed within 30 seconds. Heart rate(HR) and mean arterial pressures(MAP) were recorded before the administration of the study drug, baseline value(T-0), 3 minutes after study drug administration(T-1), immediately after tracheal intubation(T-2) and then after every 1 minute upto 5 minutes (T3-7) and then after 10 minutes of intubation (T-8).

Results: The Nalbuphine group showed significantly lesser rise in HR compared to control group after laryngoscopy and orotracheal intubation that continued till 10 minutes after intubation (p-value from <0.0001-0.0297). The Nalbuphine group also showed significantly lesser rise in MAP compared to control group after laryngoscopy and orotracheal intubation that continued till 5 minutes after intubation (p-value from <0.0001-0.0152). At 10 minutes post intubation though the rise in MAP was still lesser in Nalbuphine group than control group but it was not significant (p-value=0.0540).

Conclusion: Nalbuphine 0.2 mg kg-1 prevents a marked rise in heart rate and mean arterial pressure associated with laryngoscopy and orotracheal intubation.

Key Words: Nalbuphine, Laryngoscopy, Orotracheal Intubation, Haemodynamic Response

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INTRODUCTION

Laryngoscopy and orotracheal intubation is associated with haemodynamic response and a rise in plasma concentrations of catecholamine like noradrenaline, adrenaline and dopamine. The hemodynamic response to laryngoscopy and intubation was described in 1940 by Reid and Brace[1]. Rise in sympathetic hormones during intubation is associated with complications in high risk patients which can increase morbidity as well as mortality in some patients[2-4]. To ameliorate this pressor response, various drugs have been tried including morphine[5], remifentanil[6], alfentanil[7], sufentanil[8], fentanyl[9], tramadol[10], dexmedetomedinine[11], sufentanil[12], nalbuphine[13,14], esmolol[15], clonidine[16] and lignocaine[17].

Short acting narcotics like fentanyl, sufentanyl and alfentanyl are not freely available in Pakistan, and supply of pure narcotics like pethidine and morphine to hospitals is erratic. Use of agonist antagonist analgesics for both intraoperative and postoperative analgesia is an acceptable alternative. Nalbuphine is an agonist antagonist opioid acting on μ receptors as antagonist and ê receptor as agonist with analgesic potency equal to morphine and its antagonistic potency is approximately 1/4th that of nalorphine. Its cardiovascular stability,

longer duration of analgesia, no respiratory depression, less nausea and vomiting and potential safety in over dosage makes it an ideal analgesic for use in balanced anaesthesia[18,19].

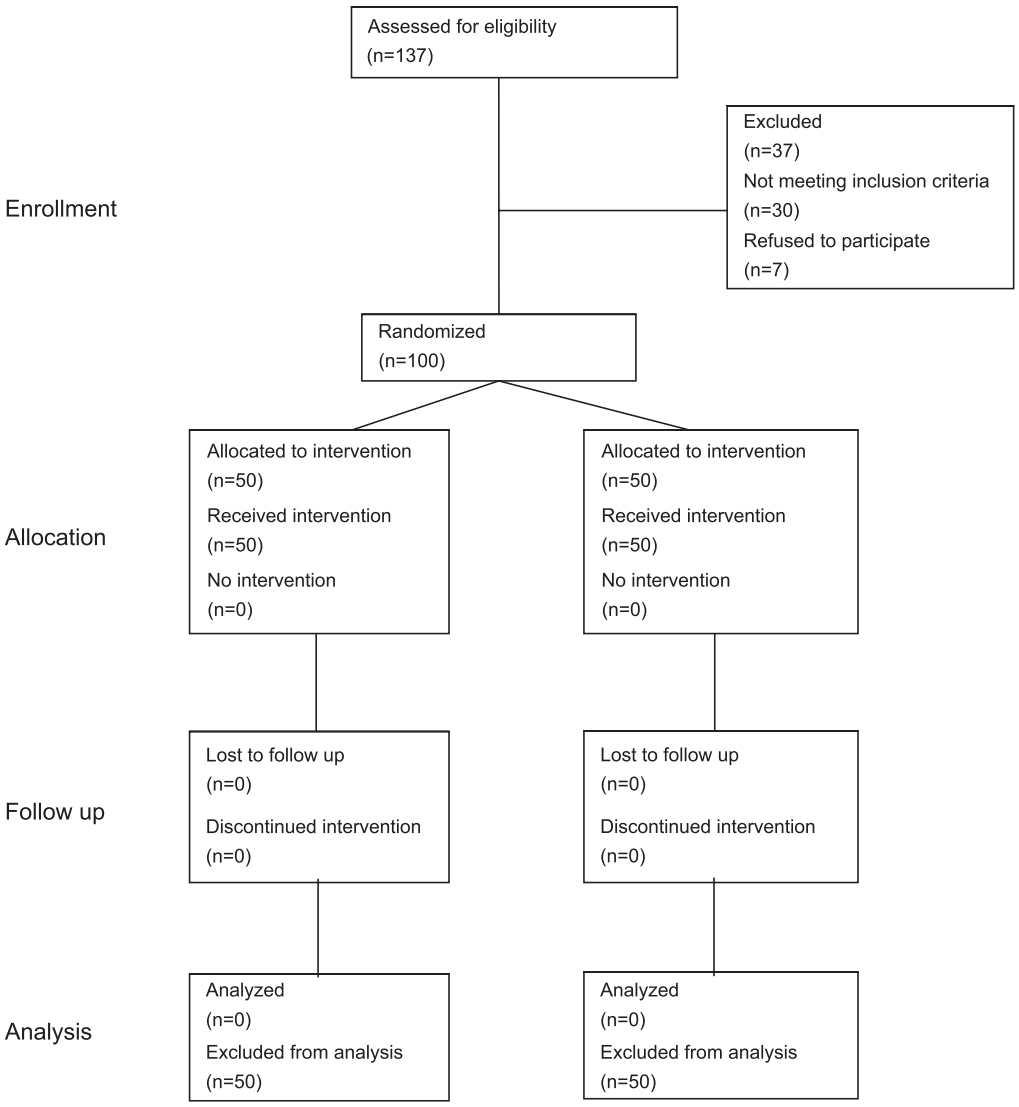
This study was designed to determine the efficacy of nalbuphine in preventing increase in heart rate and mean arterial pressure in response to laryngoscopy and tracheal intubation.

METHODOLOGY

This double blind randomized controlled trial was conducted at Department of Anaesthesiology, Institute of Kidney Diseases, Peshawar. After obtaining institutional approval and written informed consent from all the patients, 100 ASA (American Society of Anesthesiologists) grade I and II patients, both male and female between the ages of 43–67 years who were undergoing different urological procedures under general anaesthesia were enrolled in the study. Patients with ASA grade more than II, history of hypertension, diabetes, cardiac disease, bronchial asthma, patients on Beta blockers and history of allergic reaction to opioids were excluded from the study. Patients in whom the duration of laryngoscopy exceeded 30 seconds or second attempt at laryngoscopy was needed were also excluded from the study.

Figure 1 shows consort diagram of the study.

Figure 1: Consort diagram showing the flow of participants through each stage



Patients were randomly distributed to either group I (saline group, n=50) or group II (study group, n=50). Person A prepared the drugs. Person B injected the drugs and observed the response heart rate (HR) and mean arterial pressure (MAP)) and person C who was an experienced qualified anaesthesiologist, intubated the patient. Both B and C were kept unaware of the drug injected.

Group I received normal saline 5ml and group II received nalbuphine 0.2mg kg^{-1} diluted to 5 ml with normal saline 5 minutes, before intubation. Anaesthesia was then induced with propofol (2mg kg^{-1}) and atracurium (0.6mg kg^{-1}). Patients were intubated using cuffed endotracheal tube (size was standardized to be 7 for females and 8 for males) by an experienced anaesthesiologist so as to keep the intubation time less than 30 seconds. After tracheal intubation, anaesthesia was maintained with nitrous oxide, oxygen (70:30) and isoflurane up to 0.5 MAC. Ventilation of lungs was adjusted so as to maintain ETCO2 between 35 and 45 mmHg.

Heart rate (HR) and mean arterial pressures (MAP) were recorded before the administration of the study drug at baseline (T-0), 3 minutes after study drug administration(T-1), immediately after tracheal intubation (T-2) and then after every 1 minute upto 5 minutes (T3-7) and after 10 minutes of intubation (T-8). No surgical stimulus was given for 10 minutes post intubation. Data was collected and the results were subjected to statistical analysis. Statistical analyses were performed using SPSS (Statistical Package for Social Sciences) Quantitative variables were expressed as mean ± SD (standard deviation), while qualitative variables were expressed as percentage. Age and weight were analyzed by using student t-test, while gender, frequency of shivering and use of rescue antiemetic were analyzed by using chi-square test. P-value less than 0.05 were considered significant.

RESULTS

There were no statistically significant differences among the two groups regarding age, weight and sex (Table 1).

Heart rate changes

There was no statistically significant difference among the groups in heart rate recorded before the administration of the study drug i.e. baseline value (T-0) and 3 minutes after study drug administration (T-1) (Table 2). The increase in heart rate at intubation was seen in both the groups compared to the baseline values. This increase continued till 10 minutes after intubation (T-2 to T-8), but the rise was minimal in patients administered nalbuphine (group II, study group) as compared to patients who were given saline (group I, control group), and was statistically significant ($P<0.05$). The maximum increase in heart rate was seen 1 minute after intubation (T-3) in both groups.

Mean arterial pressure changes

There was no statistically significant difference among the groups in mean arterial pressure recorded before the administration of the study drug i.e. baseline value (T-0) and 3 minutes after study drug administration (T-1) (Table 3). The increase in mean arterial pressure was seen in both the groups compared to the baseline values. This increase continued till 05 minutes after intubation (T-2 to T-7). But the rise was minimal in patients administered nalbuphine (group II, study group) as compared to patients who were given saline (group I, control group), which was statistically significant ($P<0.05$). The maximum increase in heart rate was seen 1 minute after intubation (T-3) in both groups. At 10 minutes post intubation (T-8) though the rise in MAP was still lesser in Nalbuphine group than control group but it was not significant (p-value 0.0540).

DISCUSSION

Direct laryngoscopy and tracheal intubation cause increase in blood pressure and heart rate[20]. Mechanism of cardiovascular response to intubation is assumed to be a reflex sympathetic reaction to the mechanical stimulation of larynx and trachea. Reflex changes in the cardiovascular system after laryngoscopy and intubation lead to an average increase in blood pressure by 40-50% and 20% increase in heart rate[21]. Nalbuphine has onset of action between 2-3 minutes, duration of action

Table 1: Demographic Data

Variable	Group A	Group B
Age (years)	54.59 ± 10.82	56.46 ± 10.19
Sex (M:F)	38 : 12	35 : 15
Weight (Kg)	74.13 ± 05.86	75.43 ± 06.54

Table 2: Heart Rate Changes expressed as Mean± Standard Deviation

Time	Group I n=50	Group II n=50	P-Value	Significance
T-0	88.33 ± 10.45	89.13 ± 9.77	0.6934	Not Significant
T-1	89.61 ± 10.88	87.92 ± 8.46	0.8060	Not Significant
T-2	107.33 ± 11.49	96.81 ± 10.22	<0.0001	Significant
T-3	107.69 ± 10.93	97.47 ± 10.34	<0.0001	Significant
T-4	105.33 ± 10.55	96.62 ± 9.93	<0.0001	Significant
T-5	105.19 ± 10.27	96.24 ± 9.54	<0.0001	Significant
T-6	102.58 ± 9.72	95.87 ± 8.96	0.0005	Significant
T-7	101.28 ± 8.76	95.12 ± 8.34	0.0005	Significant
T-8	98.44 ± 9.62	94.36± 8.86	0.0297	Significant

Table 3: Mean Arterial Pressure Changes expressed as Mean± Standard Deviation

Time	Group I n=50	Group II n=50	P-Value	Significance
T-0	92.60 ± 5.44	91.83 ± 6.66	0.5281	Not Significant
T-1	88.23 ± 6.87	87.56 ± 5.48	0.5910	Not Significant
T-2	99.28 ± 6.46	93.12 ± 3.77	< 0.0001	Significant
T-3	101.83± 13.22	95.31 ± 6.91	0.0026	Significant
T-4	98.45 ± 7.59	94.27 ± 1.22	0.0002	Significant
T-5	96.76 ± 3.95	94.82 ± 3.66	0.0124	Significant
T-6	96.87 ± 4.56	94.53 ± 6.33	0.0365	Significant
T-7	94.77 ± 3.22	93.57 ± 1.19	0.0152	Significant
T-8	94.45 ± 2.23	93.52 ± 2.53	0.0540	Not Significant

of 3-6 hours, with cardiovascular stability and minimal side effects in the dose of 0.2-0.4mg kg^{-1} [18,19].

In our study, nalbuphine prevented the rise in heart rate and mean arterial pressure which was statistically significant compared to the control group. Chawda et al[22] studied 60 patients for elective laparoscopy surgery to receive either saline or Nalbuphine 0.2mg kg^{-1} .Nalbuphine 0.2 mg kg^{-1} prevented a marked rise in heart rate and mean arterial pressure associated with laryngoscopy and orotracheal intubation. Our result can be compared to this study for HR increase and MAP.

Another study by Ahsan[23] and colleagues also compared nalbuphine 0.2mg kg^{-1} with placebo. They noticed increases in HR and MAP just after induction which was significant i.e. more than 20% rise from baseline in placebo group. Nalbuphine prevented this rise which was significant as in our study.

Chestnutt[24] had also studied effects of nalbuphine, pethidine and placebo and noticed excellent control of haemodynamic response in minor gynaecological surgery in nalbuphine as well as pethidine group, but noticed nausea and vomiting at the end of surgery which was more in pethidine group. We did not notice nausea and vomiting in our patients as the dose used was 0.2 mg kg^{-1} compared to the higher dose used in Chestnutt's study.

Kothari and Sharma[25] also used nalbuphine in the dose of 0.2 mg kg^{-1}. They noticed effective reduction in heart rate and mean arterial pressure as compared to pentazocine. Our study also supports their results.

CONCLUSION

We thereby conclude that nalbuphine (0.2mg kg^{-1}) administered 5 minutes before laryngoscopy prevents rise in HR and MAP following laryngoscopy and endotracheal intubation.

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CONTRIBUTORS

MAT planned the study, did data analaysis and wrote manuscript. ZI and Q helped in manuscript writing. All authors contributed significantly to the final manuscript.