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Research Article

Intravenous Clonidine Vs Intravenous Dexmedetomedine as Adjuvant to Propofol for Insertion of Laryngeal Mask Airway, A Clinical Comparative Study

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Abstract: Airway management is one of the prime concerns for anesthesiologists. The laryngeal mask airway (LMA) has gained widespread popularity for airway management during surgery. In this study, we compared the jaw relaxation, hemodynamic stability, respiratory condition, apnea time and patient's response conditions and secondary outcome produced by lntravenous Dexmedetomidine and clonidine as an adjuvant with propofol. This study was conducted at Mamatha medical college and General hospital, Khammam in the Department of Anesthesia after obtaining permission from the hospital ethics committee. A total of 100 patients were included in the study. These patients were divided in to two groups of each 50. The group D patients were treated with Dexmedetomidine (1 µg/kg) and group C patients were treated with clonidine (2 µg/kg). Patients were of American Society of Anesthesiologists (ASA) physical status 1 and 2. Age of patients varied from 15 years to 60 years. Weight of patients was between 25 to 80 kg. These Patients were undergoing various elective minor surgical procedures under general anesthesia. Grade I jaw relaxation was seen in 70% of patients in Group C and 80% of the patients in Group D. P value was 0.003, which was significant. 20% of the patients in Group D had mild coughing or gagging, while 40% in Group C had mild coughing or gagging. No patients had severe coughing. The rate of mild patient movements were significantly higher in the group C. Mild laryngospasm was observed in group C. In Group C, 48% patients had excellent LMA insertion conditions, while 82% of the patients had excellent insertion conditions in Group D which was significantly higher. The duration of Apnoea was significantly lower in group D. Respiratory rates were comparative at baseline and after 45 min. There was significant difference observed at LMA insertion and it comes to optimum rate with in 30min. Baseline mean HR was comparable in both the groups and on LMA insertion. After 1min-15min the HR rates were significantly lower in group C but they were non-significant after 30 min. In our study 6 patients in Group-D developed bradycardia but did not need inj. atropine. Mean arterial blood pressure (mmHg) readings were not statistically significant at baseline, and after 45 min. But highly significant differences were noted at other time intervals. Hypotension was noted in 8 patients of Group-D intra operatively and it was treated successfully with i.v.fluids only. In this study it was concluded that both the drugs clonidine and Dexmedetomidine decreased the dose of propofol. Dexmedetomidine was more efficient than clonidine.

Keywords: Dexmedetomidine, clonidine, laryngeal mask airway, jaw relaxation, hemodynamic stability, respiratory rate.

INTRODUCTION

Airway management is one of the prime concerns for anesthesiologists. The best way of securing airway is by tracheal intubation. However, it is associated with many complications. It has an airway tube that connects to an elliptical mask with a cuff. For moderate to minor surgical procedures LMA is an alternative to endotracheal tube. The laryngeal mask airway (LMA) has gained widespread popularity for airway management during surgery (Brain, A. I. J. *et al.*, 1985).

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The LMA was conceived and designed by Dr. Archie Brain in UK in 1981 and following prolonged research it was released in 1988 for clinical use. Today, it has a clearly established role as an airway device in the elective setting where neither the procedure nor the patient requires endotracheal intubation. It is a good alternative to continued bag and mask ventilation and has proved extremely useful in managing the difficult airway.

The laryngeal mask airway (LMA) is a device, which allows both spontaneous, as well as positive pressure ventilation. The search to find the optimum anesthesia to provide excellent conditions for LMA insertion has been going on. Various intravenous (i.v.) and inhalational induction agents have been used. Intravenous agents (IV) especially propofol is preferred for insertion of LMA (Uzümcügil, F. *et al.,* 2008). As propofol lacks analgesic property, causes cardiorespiratory depression opioids are added but, they failed to prevent laryngospasm in spite of normocapnia and dose-dependent depression of airway reflexes (Kodaka, M. *et al.,* 2004). In order to decrease the adverse effects of propofol, fentanyl and now newer α2 agonists such as dexmedetomidine, clonidine or muscle relaxants were added to reduce the propofol dose requirement.

Dexmedetomidine, a highly selective α2-adrenoceptor agonist, has been shown to have sedative and analgesic properties, anxiolysis and sympatholysis via the receptors located in blood vessels, sympathetic terminals, locus ceruleus and spinal cord without producing respiratory depression. Dexmedetomidine, even when used at supramaximal plasma levels, has been found to be clinically safe for respiration. It was also shown to diminish airway and circulatory responses during intubation and extubation and facilitates smooth insertion of LMA, rendering this compound especially suitable for anesthesia and the perioperative period (Uzümcügil, F. *et al.,* 2008; Gupta, S. *et al.,* 2018).

Clonidine, an alpha-2 adrenergic agonist, produces sedation by decreasing the sympathetic nervous system activity and the level of arousal. It is devoid of respiratory depressant action and lacks the negative effects on cognition, memory, and behavior. Previous studies have shown that an oral clonidine premedication reduces propofol requirement for LMA insertion, (Goyagi, T. *et al.,* 2000).

In this study, we compared the jaw relaxation, hemodynamic stability, respiratory condition, apnea time and patient's response conditions and secondary outcome produced by lntravenous Dexmedetomidine and clonidine as an adjuvant with propofol.

MATERIALS & METHODS

This study was conducted at Mamata medical college and General hospital, Khammam in the Department of Anesthesia after obtaining permission from the hospital ethics committee. A total of 100 patients were included in the study. Patients were of American Society of Anesthesiologists (ASA) physical status 1 and 2.Age of patients varied from 15 years to 60 years. Weight of patients was between 25 to 80 kg. These Patients were undergoing various elective minor surgical procedures under general anesthesia. Patients with risk of aspiration, smokers, undergoing oral surgeries, suffering from pathology of neck or upper respiratory tract, weighing more than 80 kg and ASA physical status 3 and 4 were excluded from the study.

The patients selected were invited to take part in the study after explaining the benefits and risks. Informed consent was obtained from those individuals who were willing for the study. The age, weight and airway assessment were done.

The Airway was Assessed According to-

- Mallampati classification.
- The Thyromental distance.
- The mouth opening - It is measured and assessed as less than or equal to 6 cm or greater than 6 cm.

The patients were kept nil per orally for 8 hours. The basal heart rate, systolic and diastolic blood pressure were noted. Randomisation was done using a computer generated random number table into Group C (Those who received clonidine 2 microgram per kilogram as adjuvant to propofol) and Group D (Those who received dexmedetomedine 1 microgram per kilogram as adjuvant to propofol). According to weight of the patient's appropriate size Classic LMA was kept ready. LMA cuff was checked and deflated. A water based jelly was applied over the cuffed portion as per manufacturer regulations. Monitors included Electrocardiogram, Non-invasive blood pressure and Pulse-oximeter.

All patients were premeditated with midazolam 0.02 mg per kg and glycopyrrolate 0.2 mg intravenously. They were preoxygenated with 100% oxygen for three minutes. Then they were given the assigned drugs over 10 seconds. The patients in Group C received clonidine 2 microgram per kilogram intravenously and those in Group D received Dexmedetomidine 1 microgram per kilogram intravenously. Anaesthesia was induced with Inj. Propofol 2.5 mg per kg intravenously over a period of 15 seconds. Whenever needed, incremental doses of propofol 0.5 mg per kg were given every 30 seconds till loss of consciousness and loss of eye lash reflex was achieved. Sixty seconds later LMA insertion was performed by a blinded observer. Patients were given additional doses of 0.5 mg per kg on every unsuccessful

attempt. The jaw relaxation and overall LMA insertion conditions were graded at the first attempt only.

LMA insertion was attempted for a maximum of 3 times. Patients were then kept on spontaneous respiration. Anaesthesia was maintained with nitrous oxide 60% and oxygen 40%. Heart rate and non-invasive blood pressure were recorded pre-induction, immediately after induction of anaesthesia and after insertion of LMA. ECG monitoring was done to record any arrhythmias. Continuous pulse oximeter monitoring was done during surgery. Non-invasive blood pressure was monitored every ten minutes. At the completion of surgery, nitrous oxide was stopped and LMA was removed and 100% oxygen with face mask was continued till recovery.

Following Parameters were observed during Insertion of LMA

1. Jaw Relaxation was assessed according to Young's Criteria. This was assessed on a Three-Point Scale

- Absolutely relaxed with no muscle tone.
- Moderately relaxed with some muscle tone.
- Poorly relaxed with full muscle tone.

2. Coughing and Gagging - This was Assessed on a Four-Point Scale

- No coughing or gagging.
- Mild coughing, gagging.
- Moderate coughing, gagging.
- Severe coughing, gagging.

3. Laryngospasm was Assessed on Two-Point Scale

- No laryngospasm.
- Laryngospasm.

4. Patient Movements were Assessed on a Three-Point Scale

- No movement.
- Mild movement.
- Severe movement.

5. The overall LMA insertion condition was assessed according to modified scheme of Lund and Stovener.

- Excellent - No coughing or gagging, no patient movement or laryngospasm.
- Good - Mild gagging, coughing or mild patient movement with no laryngospasm.
- Poor - Moderate gagging, coughing or mild patient movement with no laryngospasm.
- Unacceptable - Severe gagging, coughing or severe patient movement or laryngospasm

RESULTS

This study was conducted at Mamata medical college and General hospital, Khammam in the Department of Anesthesia after obtaining permission from the hospital ethics committee. A total of 100 patients were included in the study. These patients were divided in to two groups of each 50. The group D patients were treated with Dexmedetomidine and group C patients were treated with Clonidine. Patients demographic data was shown in table 1. There were no significant differences between the two groups with respect to demographic data, anthropometric data and ASA PS status

Table 1: Demographic data

parameter	Group -C	Group D
Average age	44.5 ±17.5	48.5 ±14.5
Average weight	55.75±10.2	59.67±11.7
Average height	151.7±11.27	152.8±10.34
Male/Female	20/30	24/26
ASA Status	22/28	24/26

In our study, comparison of jaw relaxation between Groups C and D was considered as primary objective. Grade I jaw relaxation was seen in 70% of patients in Group C and 80% of the patients in Group D. P value was 0.003, which was significant. 20% of the patients in Group D had mild coughing or gagging, while 40% in Group C had mild coughing or gagging. No patients had severe coughing. The rate of mild patient movements were significantly higher in the group C. Mild laryngospasm was observed in group C. In Group C, 48% patients had excellent LMA insertion conditions, while 82% of the patients had excellent insertion conditions in Group D which was significantly higher. The duration of Apnoea was significantly lower in group D.

2. Outcome of LMA

	Group C	Group D
Jaw relaxation		
Grade I	35	40
Grade II	10	09
Grade III	05	01
Coughing and Gagging		
Grade I	26	37
Grade II	20	10
Grade III	4	1
Patient movements		
Grade I	23	24
Grade II	22	20
Grade III	6	4
Laryngospasm		
Grade I	38	27
Grade II	18	9
Grade III	4	4
Overall LMA insertion		
Excellent	24	41
Good	26	09
Others		
Duration of Apnoea	286 sce	222 sec
Spontaneous ventilation	18	20
Breath holding	19	13
Expiratory stridor	0	0
Lacrimation	0	0

Respiratory rates were comparative at baseline and after 45 min. There was significant difference observed at LMA insertion and it comes to optimum rate with in 30min (fig 1). Baseline mean HR was

comparable in both the groups and on LMA insertion. After 1min-15min the HR rates were significantly lower in group C but they were non-significant after 30 min (fig 2). In our study 6 patients in Group-D developed bradycardia but did not need inj. atropine. Mean arterial blood pressure (mmHg) readings were not statistically significant at baseline, and after 45 min. But highly significant differences were noted at other time intervals (fig 3). Hypotension was noted in 8 patients of Group-D intra operatively and it was treated successfully with i.v. fluids only.

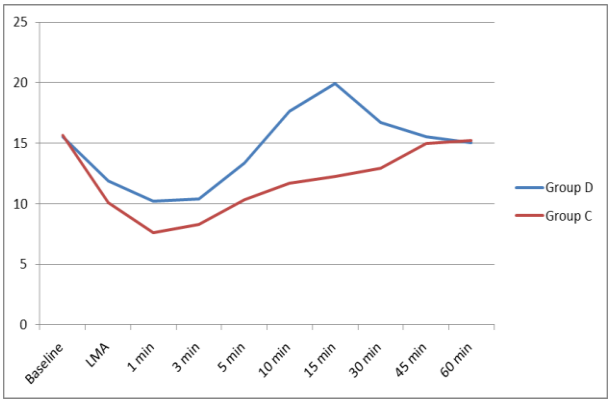

Fig 1: Comparison of Respiratory rate

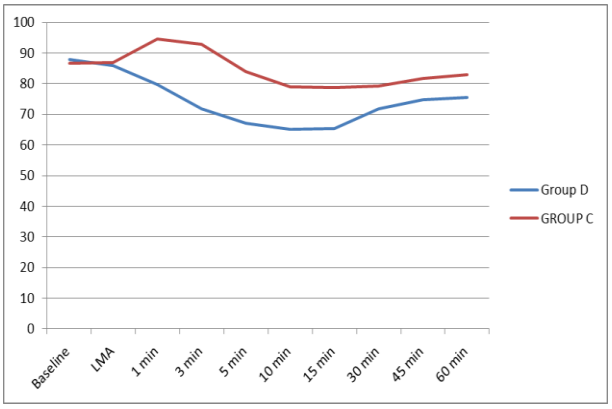

FIG 2: Comparison of mean heart rate

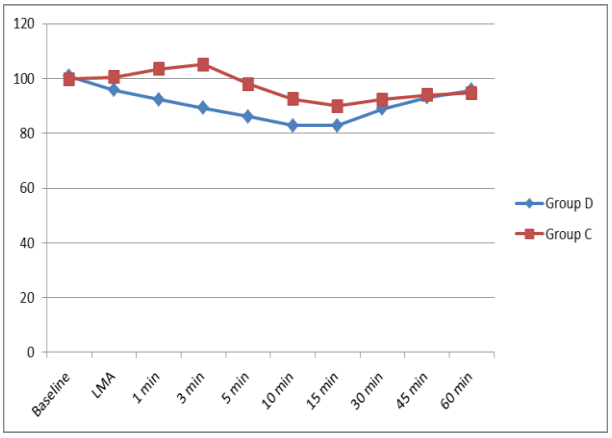

FIG .3 Comparison of mean arterial pressure

DISCUSSION

Smooth insertion of LMA needs sufficient depth of anesthesia to suppress the airway reflexes and relax the jaw muscles (Dutt, A. *et al.*, 2012).

In accordance with the studies by Belleville *et al.*, (1992) and Uzümcügil *et al.*,., (2008) dose of dexmedetomidine used for intraoperative sedation, was 1 µg/kg given over 2 min. The intention was both to achieve rapid sedation and avoid alpha-1 side-effect such as hypertension and tachycardia. The obstructive respiration pattern and irregular breathing seen with such doses are probably related to deep sedation as well as anatomical features of the patient, and this could be overcome by insertion of an oral airway (Miller, R.D. 2010). In our study we used dexmedetomidine dose as 1 µg/kg given over 2 min and clonidine dose was 2 µg/kg given over 2 min respectively in group D and C.

Heart rate does not change significantly after an induction dose of propofol. Propofol either may reset or inhibit the baroreflex, reducing the tachycardic response to hypotension. On the contrary, dexmedetomidine causes decrease in the HR by 27% after induction and returns to normal by 15 min.[8]In some studies also there decrease in heart rate similar to our study (Surabhi, A. *et al.*, 2014; Jayaram, A. *et al.*, 2014). Mechanism for reducing HR during dexmedetomidine may be by increasing vagal tone and reducing sympathetic drive, the re□ex HR slowing to the pressor stimulus was augmented by dexmedetomidine (Bhartia, N. *et al.*, 2018; Ebert, T.J. *et al.*, 2000).

Patients of group-D showed fall in MAP from 1 min onward after LMA insertion. Dexmedetomidine inhibits release of noradrenaline and central sympathetic activity, therefore, can decrease BP and HR. Plasma noradrenaline concentration is markedly reduced with dexmedetomidine. Biphasic effect of dexmedetomidine is caused by the inhibition of the central sympathetic outflow overriding the direct stimulant effect (Bhartia, N. *et al.*, 2018; Ebert, T.J. *et al.*, 2000).

In a study, as expected shows increase in RR in dexmedetomidine group compared to fentanyl group. Dexmedetomidine is unique among sedatives as it is clinically safe from a respiratory point of view, even during doses high enough to cause unresponsiveness to vigorous stimulation and exhibiting hypercarbic arousal phenomenon similar to the ones described during natural sleep (Hsu, Y. W. *et al.*, 2004). Our results were in agreement with these results (Surabhi, A. *et al.*, 2014; Jayaram, A. *et al.*, 2014).

Dexmedetomidine gives better preservation of spontaneous respiration in some respective studies. Hypercapnic arousal phenomenon remains intact by dexmedetomidine, thus its sedation mimicking the

natural sleep. The respiratory effect of dexmedetomidine is because one of its action on locus ceruleus, which is known to play a role in both respiratory control and sleep modulation. Dexmedetomidine is unique among sedatives as it is clinically safe from a respiratory point of view, even during doses high enough to cause unresponsiveness to vigorous stimulation and exhibiting hypercarbic arousal phenomenon similar during natural sleep (Nellore, S. S. *et al.*, 2016; Hsu, Y. W. *et al.*, 2004).

The study by Uzümcüügil *et al.*,., (2008) showed that the numbers of patients developing apnea were more in Group F than in Group D. Breath holding/apnea was more in Group Fentanyl and spontaneous ventilation was more in Group D indicating that respiration was better preserved in the dexmedetomidine group. The study conducted by Goh *et al.*,., (Goh, P. K. *et al.*, 2005) the duration of apnea was longer in Group F (290 s) than in Group D (227 s). The apnea developed in patients of Group D (14) was probably because of the depressant effect of propofol. However, as the respiratory depressant effect of propofol was not potentiated by dexmedetomidine the apnea times were significantly shorter. These results were in accordance to our results.

To the author knowledge there were no studies on intravenous clonidine in LMA but clonidine was used orally in some studies. Oral clonidine premedication reduces propofol requirement for LMA insertion (Goyagi, T. *et al.*, 2000; Higuchi, H. *et al.*, 2002). Use of intravenous clonidine was also effective in LMA and it also gives good results.

In this study it was concluded that both the drugs clonidine and Dexmedetomidine decreased the dose of propofol. . In Group C, 48% patients had excellent LMA insertion conditions, while 82% of the patients had excellent insertion conditions in Group D which was significantly higher.

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