Original Research Article

Comparison of hemodynamic and respiratory effects of dexmedetomidine combined with propofol versus fentanyl propofol being control for insertion of I gel

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Abstract

Background: I Gel is an airway device that requires adequate depth of anaesthesia and suppression of upper airway reflexes thereby providing optimal insertion conditions. **Aim:** To compare dexmedetomidine and fentanyl for co-induction with propofol with respect to I Gel insertion conditions, haemodynamic variation and the total dose requirement of propofol. **Materials and methods:** This was a prospective randomized study, a total of 90 patients belonging to the American Society of Anesthesiologists (ASA 1 and 2) Patients were randomized into three groups to receive either propofol with dexmedetomidine or propofol with fentanyl and propofol only during insertion of I gel, Ninety seconds after propofol injection, I GEL of appropriate size was inserted. Proper placement was confirmed by capnography. Conditions of I Gel insertion were recorded and assessed, haemodynamic parameters, namely Heart rate(HR), mean blood pressure (MAP), sp02 and spontaneous respiratory rate (RR) were recorded and assessed before and after the insertion of I GEL, at the end of 1st, 2nd, 3rd, 5th and 10th minute after the insertion. Informed consent and IEC clearance obtained. Statistical Analysis was done using SPSS 19.0. **Result:** The Mean Age of patients who received Dexmedetomidine and Propofol is 30±7 Years, the Mean Age of patients who received Fentanyl and Propofol is 31 ±7 Years and the Mean Age of patients who received only Propofol is 30±6 Years. Male female ratio was 1:0.9. The mean Heart rate in patients who received combination of Dexmedetomidine with Propofol drugs has better hemodynamically stable over in patients who received antanyl-Propofol and patients who received only Propofol and this difference observed statistically significant at the 3min, 5min and 10min. The Mean Arterial pressure is initially increased, who received combination of Dexmedetomidine and Propofol drugs at pre operatively. During I Gel insertion and later from 1min, 3min, 5min and 10min, Dexmedetomidine-propofol group has lesser Mean Arterial pressure compared to those who received Fentanyl Propofol and Propofol only, this difference is statistically significant at all-time intervals. The mean basal RR were comparable ($p>0.05$) in three groups. There was statistically significant ($p<0.001$) increase in the RR in Group D from 5 min onwards after insertion of I GEL which got stabilized at 10 min. There was a fall in RR after induction with profol followed by a rise. The magnitude of fall in RR from the base line value to that after induction with propofol was significantly more ($p<0.05$) in the fentanyl group than dexmedetomidine group. **Conclusion:** Dexmedetomidine-Propofol is better and more effective, and provides stable hemodynamic profile and superior to Propofol-fentanyl and only propofol, in preserving respiration.

Key Word: I Gel.

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INTRODUCTION

The I Gel is a device with a lumen that provides a seal around the laryngeal inlet. It allows spontaneous ventilation, as well as positive pressure ventilation with an airway pressure <15 cm H_2O.[1] An I GEL can be used safely in operations allowing spontaneous ventilation, instead of a face mask[2]. It has been shown that insertion of I GEL requires lighter anaesthesia levels than endotracheal intubation.[1] I GEL insertion

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requires adequate mouth opening and minimal upper airway reflexes such as coughing, gagging or laryngospasm[3]. Because of these reasons, there have been many studies to find the optimum anaesthetics to provide excellent conditions for I GEL insertion. Since the time required for I GEL insertion was reported to be longer with inhalational anaesthetics, intravenous (i.v.) agents have been preferred[4]. Also patient satisfaction was found better with i.v. anaesthetics[5]. Among the i.v. agents, propofol has been preferred the most because of its potential suppressor effects on upper airway reflexes[3]. When used alone without premedication, propofol provides conditions for I GEL insertion that is far from satisfactory[6] and causes cardiorespiratory depression[7]. In order to decrease the adverse effects of propofol, opioids or muscular relaxants were added to reduce the propofol dose requirement[8]. Muscle relaxants were not found to be effective[9] and even found to increase the risk of aspiration. Fentanyl and remifentanil were studied. Unfortunately, these medications increased the incidence and duration of apnoea[6,10]. Dexmedetomidine, a highly selective a_2-adrenoceptor agonist, was shown to have sedative and analgesic properties. a_2-adrenoceptors have many locations in the central nervous system (CNS). a_2- adrenoceptor agonists were reported to exert their sedative effects via the receptors in locus coeruleus, known to have a role in respiratory control and function as an alarm system. Hsu and colleagues[11] reported dexmedetomidine, even when used at supramaximal plasma levels, to be clinically safe for respiration. Dexmedetomidine was also shown to diminish airway and circulatory responses during intubation and extubation[12].In this study, we aimed to provide successful I GEL insertion conditions by using dexmedetomidine with propofol and to compare its effect with fentanyl combined with propofol.

MATERIALS AND METHODS

This was a prospective randomized study that was conducted in the Department of Anesthesiology at Sree Mookambika Institute of Medical Sciences, Kulasekharam, during the period of December 2018 to May 2019. The study was approved by the hospital ethics committee and obtaining informed consent from patients. A total of 90 patients age group 18-60 years belonging to the American Society of Anesthesiologists (ASA) grade I or II were included in the study. Patients were randomized into three groups to receive either propofol with dexmedetomidine (group D; n = 30) or propofol with fentanyl (group F; n = 30)and propofol (group P; n = 30)only during insertion of I gel. Patients with significant cardiopulonary, respiratory, endocrinal, hepatic, Renal and metabolic disorders, Pregnant and breast feeding woman, who have undergone recent surgeries(within 7 days) and allergy to above the drugs were excluded in the study. Preparation of patients included period of overnight fasting, premedication with single dose of oral alprazolam 0.25 mg and ranitidine 150 mg, metoclopramide 10 mg, with sips of water ,2 hours before the procedure on the day of surgery, Patients were shifted to the operating room and the following parameters were monitored; electrocardiogram '(ECG), arterial oxygen saturation by pulse oximetry (SpO2) and noninvasive blood pressure monitoring. An intravenous line was secured with 18G cannula under local anaesthesia. Pre oxygenation was done for 3 min with a face mask at 8 L/min of oxygen flow. In Group F, 1 μg/kg fentanyl diluted in 10 ml normal saline (NS) was given over 2 min. In Group D, 1μg g/kg dexmedetomidine diluted in 10 mL NS was given over 2 min. After, 30 sec, inj. propofol 2 mg/kg was administered to both the groups. Anesthesia was maintained by 50% nitrous oxide and oxygen and1 to1.5% sevoflurane titrated accordingly, with a fresh gas flow of 8 L/min and patient was ventilated manually via face mask when required, otherwise, spontaneous ventilation was allowed. Ninety seconds after propofol injection, I GEL of appropriate size was inserted .Proper placement was confirmed by capnography. If the first attempt of I GEL insertion failed, a second attempt was tried after administering an additional dose of intravenous propofol (0.5mg/kg).

RESULTS

The Mean Age of patients who received Dexmedetomidine and Propofol is 30±7 Years, the Mean Age of patients who received Fentanyl and Propofol is 31 ±7 Years and the Mean Age of patients who received only Propofol is 30±6 Years. Male female ratio was 1:0.9.The mean Heart rate in patients who received combination of Dexmedetomidine and Propofol drugs has better control over in patients who received Fentanyl and Propofol and patients who received only Propofol and this difference observed is statistically significant at the 3min, 5 min and 10 min though at the beginning it is not statistically significant.The Mean Arterial pressure is initially high who received combination of Dexmedetomidine and Propofol drugs at pre operatively later on dip at I GEL insertion and later on during 1min, 3 min , 5min and 10 min time frame this group has lesser Mean Arterial pressure compared to those who received Fentanyl and Propofol and this difference is statistically significant at all-time intervals. The saturation remained nearly

similar at all-time intervals with Dexmedetomidine and Propofol group, Fentanyl and Propofol group and patients who received only Propofol.

DISCUSSION

Endotracheal intubation is the most widely accepted general anesthesia technique but has complications, most of which arise from the need to visualize and penetrate the laryngeal opening. Increasing emphasis on day care anesthesia, lead to greater use of the SGA in place of facemask and endotracheal intubation during anesthesia.In1981 Dr Archie Brain began looking at the anatomy of upper airway and he began to develop laryngeal mask airway[13].It was primarily designed to provide some advantage over endotracheal intubation, by avoiding visualization of the vocal cords or damaging it. Satisfactory insertion of SGA insertion requires suppression of airway reflexes. A popular method of providing anesthesia for I GEL insertion is with use of IV propofol, which has the advantage of inducing anesthesia rapidly and depressing upper airway reflexes. The I GEL is a device, with a lumen that provides a seal around the laryngeal inlet. It was introduced by Mohammed Nazir from Pakistan, it is made up of styrene ethylene butadiene styrene gel (Thermoplastic elastomer). It allows spontaneous ventilation as well as positive pressure ventilation with an airway pressure of <15cm of water. 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. In the present study comparing with Blake *et al*[14],there is significant increased in heart rate with propofol which has increased from 3rd minute to 10th minute compared to propofol dexmedetomidine and propofol fentanyl On the contrary, dexmedetomidine causes decrease in the HR by 25% after induction and returns to normal by 10thmin. This might probably be because insertion of a bulky device like I GEL could have caused some sympathetic response increasing the effects of dexmedetomidine (inhibits the sympathetic activity by agonizing the postsynaptic membrane alpha2 receptor).Causing bradycardia on HR compared to previous study by Ramaswamy *et al*[15]and F.Uzumcugil *et al*[16], present study, as expected shows increase in RR in dexmedetomidine group compared to fentanyl group and propofol group. Dexmedetomidine, when used before propofol induction provides successful laryngeal mask insertion comparable to fentanyl, while preserving respiratory functions more than fentanyl.[17] No episodes of apnea were recorded, supported by the studies done by Venn *et al*[18] who had shown that hypercapnic arousal phenomenon was not affected by Dexmedetomidine, thus its sedation mimicking the natural sleep. The respiratory effects of Dexmedetomidine is due to its various sites of action, mainly on the locus caerulus, which is known to play a role in both respiratory control and sleep modulation. Dexmedetomidine converges on the natural sleep pathway to exert its sedative effects, whereas natural sleep does result in ventilation modulation.[19]The mean basal respiratory rate(RR) were comparable with minimum variations($p<0.05$).There was statically significant ($p< 0.001$) increase in respiratory rate in group D (dexmedetomidine-propofol) from 3 minutes onwards after insertion of laryngeal mask airway which got stabilized at 10 minutes. In the previous study by Sowmya Jayaram *et al*[20] on respiratory rate were found similar in both groups. The respiratory depression in Group F was found to be greater than that in group D when compared in terms of number of patients developing apnoea. 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.[19]There was a statistically significant reduction from the base line in all the pressures measured especially Mean arterial pressure. Previous study by Scheinin B *et al*[21] were found similar results to the present study. The use of dexmedetomidine was associated with a decrease in MAP and HR, which might result from decrease in noradrenaline release, a decrease in centrally mediated sympathetic tone and an increase in vagal activity. Dexmedetomidine is reported to produce severe bradycardia, hypotension, hypertension and arrhythmias as side-effects. We never encountered severe hypertension or arrhythmias in our study. Moderate hypotension was managed by IV fluid administration. In accordance with the studies by and Uzumcugil *et al*,[16] and Belleville *et al*[22] 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[15]. We did not encounter this problem to a major extent as our study was centered on insertion conditions of laryngeal mask insertion.

CONCLUSION

Our study concluded that Dexmedetomidine-Propofol is better and more effective, and provides stable hemodynamic profile and superior to Propofol-fentanyl

and only propofol, in preserving respiration. Propofol is the suitable induction agent of choice for insertion of I GEL. When used singly, can give rise to haemodynamic instability.

Limitations: This present study was designed only on the insertion conditions of I GEL, emphasis was not given to sedation, pain, recovery and postoperative follow-up.

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