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Original Research Article

# To Compare I- Gel Insertion Conditions and Haemodynamic Status with Propofol Induction after Pre-treatment with Dexmedetomidine or Ketamine

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**Conflict of interest: Nil**

**Abstract**

**Background:** Effective airway management is critical in anesthesiology, with supraglottic airway devices (SGADs) like I-gel® offering significant advantages over traditional methods. This study assess the haemodynamic state and I-Gel insertion circumstances with Propofol induction following pretreatment with either Ketamine or Dexmedetomidine.

**Methods:** At Darbhanga Medical College & Hospital, 60 ASA Grade I/II patients between the ages of 18 and 60 who were having elective procedures were split into two groups for this randomised, double-blind study: Group D received dexmedetomidine, whereas Group K received ketamine. Patients received the respective study drug followed by propofol induction. I-gel® insertion conditions, jaw relaxation, propofol requirements, and adverse events were recorded. Statistical analysis was conducted using SPSS version 24, with $p < 0.05$ considered significant.

**Results:** Anthropometric and demographic traits of both groups were comparable ($p > 0.05$). Group D demonstrated significantly better I-gel® insertion conditions ($p < 0.01$), less requirement for additional propofol, and shorter apnoea durations compared to Group K. Fewer adverse events, including laryngospasm and gagging, were observed in Group D.

**Conclusion:** Dexmedetomidine provides superior conditions for I-gel® insertion under propofol anesthesia compared to ketamine, with better jaw relaxation, reduced propofol dose, and fewer complications. This makes dexmedetomidine a preferred pre-treatment for SGAD placement in elective surgeries.

**Keywords:** Airway management, I-gel®, dexmedetomidine, ketamine, propofol, supraglottic airway device, anesthesia.



## Introduction

One of the most crucial abilities of anesthesiologists is airway management, and failing to maintain the airway can have disastrous consequences. One tool that enables both positive pressure and spontaneous ventilation is the laryngeal mask airway (LMA). When inserting an LMA, intravenous (IV) medications are favoured, particularly propofol.[1] Because propofol lacks analgesic properties, opioids are administered; however, despite normocapnia and dose-dependent suppression of airway reflexes, they have been unable to prevent laryngospasm.

In recent decades, supraglottic airway (SGA) devices have taken center stage in airway management. In addition to serving as a channel for tracheal intubation, they can be employed as primary and emergency devices in anticipated and unexpected challenging airway circumstances by

maintaining a functioning airway for ventilation and oxygenation. [2]

Since it provides the best defence for lungs against breathing in foreign objects and has the lowest chance of becoming dislodged, “tracheal intubation” “continues to be” recognized as “the” "gold standard in airway care.” [3] But it complicates in challenging airway circumstances, demands skill, and elicits a strong pressor reaction. [8, 9] SGA devices assist avoid the issues related to laryngoscopy and intubation for patients with difficult airways, emergency scenarios, and cardiac resuscitations. “I-gel® (Intersurgical Ltd., Wokingham, UK) is a second-generation supraglottic airway device (SGAD)” that is “easier to install” and has been shown to result in “less airway morbidity than other SGADs with an inflatable cuff.” [12] The different SGADs require varied amounts of anesthesia for insertion because of differences in their internal structure and “the pressure applied over the pharyngo-laryngeal area.” When a non-paralyzed patient has i-gel® insertion, they need to be sufficiently sedated “to achieve” “proper jaw relaxation” “and to avoid side effects” “such as coughing, choking, laryngospasm, and motions of the head or limbs.” [4]

SGA devices are used for the specific purpose to decrease the incidence of complications related to endotracheal intubation namely pressor reaction and challenging airway management. A sedative agent is required to facilitate the insertion of I-gel®. Finding out a better sedative drug was the rationale of this study. “When used as the only induction drug during SGAD insertion, propofol is known to significantly inhibit pharyngo-laryngeal reflexes;” nevertheless, this suppression may cause “dose-dependent cardio-respiratory depression.” Opioids and other co-induction drugs have been employed with propofol to lessen its dosage and related side effects, as well as to make device installation easier. [5] Opioids could enhance the conditions surrounding “I-gel® insertion”, but “they are also linked to” “post-operative apnea, muscle rigidity, and prolonged anesthetic recovery,” “especially following” GA. This study was conducted with purpose to” use “the Modified Scheme of Lund and Stovener to assess the overall I-gel® insertion” conditions and jaw relaxation between pre-treatment with ketamine and dexmedetomidine under propofol anaesthesia. We also included examining changes in “the heart rate, blood pressure, length of apnoea, and total propofol requirement

## Materials and Methods

### Study Design

Randomized double blinded controlled trial

### Study Site

Department of Anaesthesiology and Critical Care, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar”

**Study Duration:** 2 Years

### Source of Data

ASA Grade I and Grade II patients of both sexes between 18 to 60 years undergoing elective surgery on General Anaesthesia

### Ethical Consideration

“The study protocol was approved by the institutional ethics committee of DMCH, Laheriasarai and complied with International Conference on Harmonization Guideline for Good Clinical Practice and the Declaration of Helsinki. Informed consent was taken from patients before surgery. Participant Information Sheet (PIS) was provided and explained to patients in their local language. Thereafter, consent was approved by taking their signature or thumb impression on the informed consent form. The data were obtained from the hospital record system after appropriate approval from the concerned authorities.”

### Sample Size

The research had 60 patients in total, including 30 participants in each group. With “EC50 of 3.18 in dexmedetomidine group” and 6.75 ± 5.0 in control group with respect to finding of Jang YE et al. (2015) [6], the minimum sample size for achieving 95% power with 0.05 alpha value was calculated to be 56

### Study Selection Criteria

### Inclusion Criteria

- Patient of either sex
- Patients of ASA Grade I and II”
- “Patients of age 18-60 years”
- Patient undergoing “elective surgery under general anaesthesia”

### Exclusion Criteria

- Patient refused to participate
- Patients with burns on their faces, necks, and mouths that are smaller Modified Mallampati class >3
- Body Mass Index >30 kg/m2
- Thyromental distance

### Intervention

"An anaesthesiologist", who was not part of the study, randomly assigned the participants into two distinct categories, D and K, using a "computer-generated randomisation system."

"Anaesthesiologist A" hid "the random group allocations" within "a sealed envelope." "An anaesthesiologist B", who was not involved in the treatment of patients as well as collecting information, unsealed the envelope and began preparing the research medicines as instructed. The researcher who presented "the I-gel®, the patients, and the anaesthesiologist" who collected "the data in the operating room were unaware of the group assignments."

**Procedure**

Patients' baseline parameters such as heart rate, Electrocardiogram (ECG), mean arterial pressure, respiratory rate and oxygen saturation were noted upon arrival to the operation theatre and monitored continuously thereafter. Intravenous access was secured with 20G cannula and Ringer's lactate solution at 2 ml/kg/hr was started. Oxygen was administered via face mask at 5L/min to prevent de-saturation. Glycopyrrolate 0.004 mg/kg was given. Group D received 1 ug/kg dexmedetomidine diluted to 10 ml with 0.9% normal saline (NS) over ten minutes followed by 5 ml of NS over 2 minutes. Group K -received Ketamine 1 mg/kg diluted with 10 mL 0.9% Normal saline intravenous over 10 minutes followed by 5 ml of NS over 2 minutes. Thirty seconds after the injection of study drugs, anaesthesia was induced with 2 mg/kg of Injection propofol given intravenously over 30 seconds.

Ninety seconds after the completion of injection propofol, I-gel® (Intersurgical Ltd, Wokingham, UK) insertion was attempted. I-gel® was chosen in accordance with the manufacturer's recommendation based on patient's weight. The square wave capnography, bilateral symmetrical chest movement, auscultation of equal breath sound and normal saturation confirmed an effective airway through I-gel®. Absence of any of the above clinical signs after I-gel® placement was defined as failed attempt. Severe gagging or coughing, laryngospasm, severe patient movement. If any of the above were present during the first attempt of the I-gel® insertion then a further bolus of 0.5 mg/kg of propofol was administered. After three attempts of failed I-gel® insertion, it was decided to abandon the study and the case proceeded under general anaesthesia with endotracheal intubation. A 12 F gastric drain tube was inserted through the I-gel® and confirmed by auscultation of epigastric air which was injected through the proximal end of the drain tube.

Number of attempts for I-gel® and drain tube insertion, number of additional propofol boluses and total dose of propofol were noted. Bradypnea (respiratory rate 30 seconds) occurred, ventilation was assisted manually but allowing spontaneous respiration to occur, via facemask (before I - gel insertion) or via I-gel® until regular spontaneous respiration resumed. Anaesthesia was thereafter maintained on oxygen, nitrous oxide (50:50) and sevoflurane 1.5 to 2 volumes percent. At the end of surgery, I-gel® was removed when the patient was able to open mouth on command and was inspected for bloodstains. Both the back and front of the I-gel® cuff were tested for regurgitation of gastric contents using litmus paper which would change its' colour in acidic pH. Adverse events such as bradycardia, hypotension, coughing, laryngospasm, bronchospasm, or desaturation if occurred were recorded and treated appropriately.

**Outcome Parameters**

Gel insertion conditions according to modified Scheme of Lund and Stovener.

- **Excellent:** No coughing or choking, no laryngospasm, and no patient movement
- **Good:** With no laryngospasm, mild to moderate coughing, choking, or patient movement.
- **Poor:** Gagging, coughing, or patient movement that is moderate to severe without laryngospasm.
- **Unacceptable:** Severe coughing, gagging, laryngospasm, or patient movement.

- Requirement of top-up dose and total dose of Propofol.
- Number of attempts, presence of apnoea (>30 seconds) and its duration
- Laryngospasm and movements based on three-point scale (nil, mild, severe)

**Statistical Analysis**

"Data from patients undergoing elective surgery under general anaesthesia were presented in tabular form using Microsoft Excel 365 and transferred to SPSS version 24 for further statistical analysis. Continuous data such as age, BMI, dose of Propofol, duration of apnoea, SBP, DBP, MAP, and heart rate were expressed as mean ± SD (standard deviation). Statistical significance of difference in continuous data between group D (Dexmedetomidine) and K (Ketamine) was evaluated by unpaired t-test. Categorical data, including age group, gender, type of surgery, I- Gel insertion conditions, presence of apnoea, incidence of laryngospasm, movements, jaw relaxation, coughing and gagging were reported as percentages and frequencies and then compared by chi-square or Fisher's exact test. A p-value of less than 0.05 was taken as cut-off for statistical significance."

**Results**

Most of the patients belonged to 31-40 years of age Group in either dexmedetomidine or ketamine group. There was "no significant difference" between dexmedetomidine group and ketamine group "with respect to age." ($p>0.05$)

| Table 1. Comparison of Age between Group D (Dexmedetomidine) and Group K (Ketamine) | | | |
|---|---|---|---|
| **Age Group** | **Group D (N = 30)** | **Group K (N = 30)** | **P-Value (Chi-square test)** |
| 18-30 | 4 (13.33%) | 2 (6.67%) | 0.67 |
| 31-40 | 12 (40.00%) | 13 (43.33%) | |
| 41-50 | 7 (23.33%) | 8 (26.67%) | |
| 51-60 | 7 (23.33%) | 7 (23.33%) | |

There were 56.67% males in dexmedetomidine group as compared to 61.67% in ketamine group. There was "no significant difference" between dexmedetomidine and ketamine group "with respect to gender." ($p>0.05$)

| Table 2. Comparison of Gender between Group D (Dexmedetomidine) and Group K (Ketamine) | | | |
|---|---|---|---|
| **Gender** | **Group D (N = 30)** | **Group K (N = 30)** | **P-Value (Fisher's Exact Test)** |
| Female | 17 (56.67%) | 19 (61.67%) | 0.71 |
| Male | 13 (43.33%) | 11 (38.33%) | |

Age of most of the patients was between 60-70 kg and most of the patients had normal BMI. There was "no significant difference" between dexmedetomidine group and ketamine group with respect to anthropometric parameters. ($p>0.05$)

| Table 3. Comparison of Anthropometric parameters between Group D (Dexmedetomidine) and Group K (Ketamine) | | | |
|---|---|---|---|
| **Parameters** | **Group D (N = 30)** | **Group K (N = 30)** | **P-Value (Unpaired t-test)** |
| Weight in kg | 63.47 ± 7.19 | 64.86 ± 6.95 | 0.28 |
| Height in meter | 1.65 ± 0.14 | 1.67 ± 0.15 | 0.45 |
| BMI in kg/m² | 23.17 ± 1.34 | 22.78 ± 1.67 | 0.16 |

Most of the patients in either dexmedetomidine or ketamine group belonged to Mallampati Class, I. There was "no significant difference" between dexmedetomidine group and ketamine group with respect to Mallampati Class. ($p>0.05$)

| Table 4: Comparison of Modified Mallampati Class between Group D (Dexmedetomidine) and Group K (Ketamine) | | | |
|---|---|---|---|
| **Modified Mallampati Class** | **Group D (N = 30)** | **Group K (N = 30)** | **P-Value (Fisher's Exact Test)** |
| I | 21 (68.33%) | 18 (38.33%) | 0.36 |
| II | 9 (31.67%) | 11 (40.00%) | |
| III | 0 (0.00%) | 1 (1.67%) | |
| IV | 0 (0.00%) | 0 (0.00%) | |

Duration of surgery of most of the patients in either dexmedetomidine or ketamine group was between 1 to 1.5 hours. There was "no significant difference" in duration of surgery in ketamine group in comparison to dexmedetomidine group. ($p>0.05$)

| Table 5: Comparison of Duration of Surgery between Group D (Dexmedetomidine) and Group K (Ketamine) | | |
|---|---|---|
| **Parameter** | **Group D** | **Group K** |
| **Number of Patients (N)** | 30 | 30 |
| **Duration of Surgery in Minutes** | 68.67 | 66.33 |
| **Standard Deviation (SD)** | 1.87 | 1.94 |
| **Difference in Mean** | 2.34 | |
| **95% Confidence Interval (Difference of Mean)** | 1.3553 to 3.3247 | |
| **P Value (Unpaired t-test)** | 0.38 | |

71.67% of patients in ketamine group had "excellent insertion conditions" as comparison to 66.67% in dexmedetomidine group. 6.67% of patients in ketamine group had poor insertion condition in comparison to no cases in dexmedetomidine group.

| Table 6: Comparison of Overall Insertion Conditions by Modified Scheme of Lund and Stovener between Group D (Dexmedetomidine) and Group K (Ketamine) | | | |
|---|---|---|---|
| **Insertion Conditions** | **Group D (N = 30)** | **Group K (N = 30)** | **P-Value (Chi-square test)** |
| **Excellent** | 20 (66.67%) | 22 (71.67%) | 0.06 |
| **Good** | 10 (33.33%) | 6 (21.67%) | |
| **Poor** | 0 (0.00%) | 2 (6.67%) | |

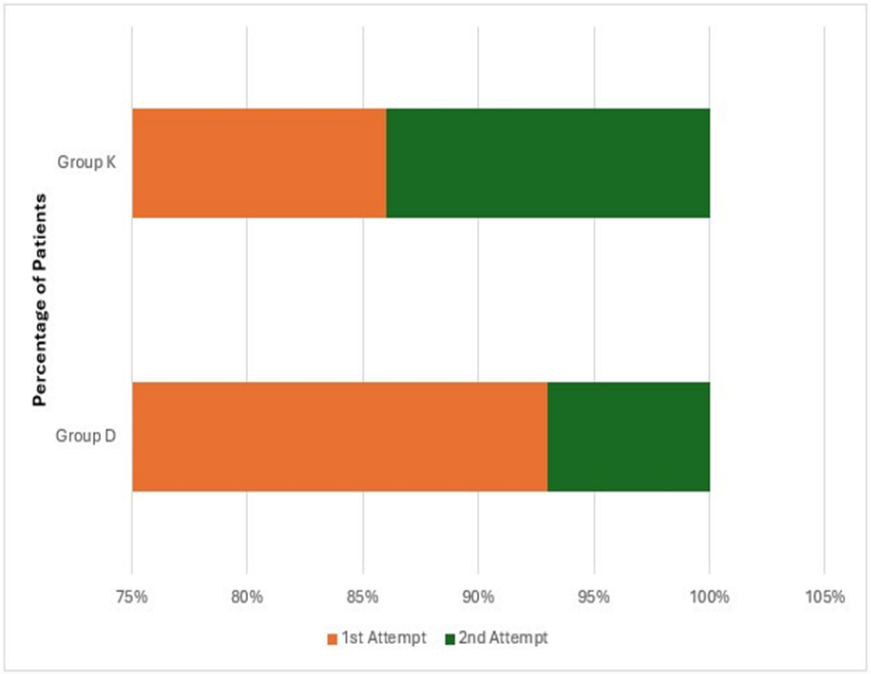


**Figure 1. Comparison of attempts between Group D (Dexmedetomidine) and Group K (Ketamine)**

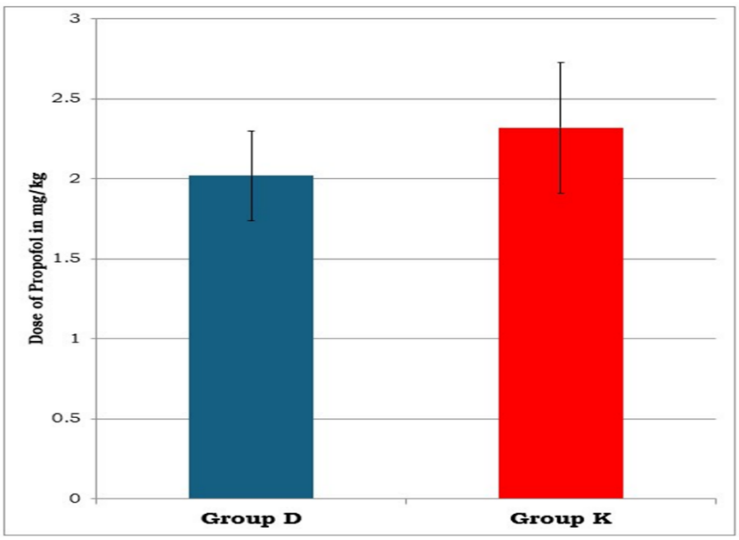


**Figure 2: Comparison of Total Dose of Propofol between Group D (Dexmedetomidine) and Group K (Ketamine)**

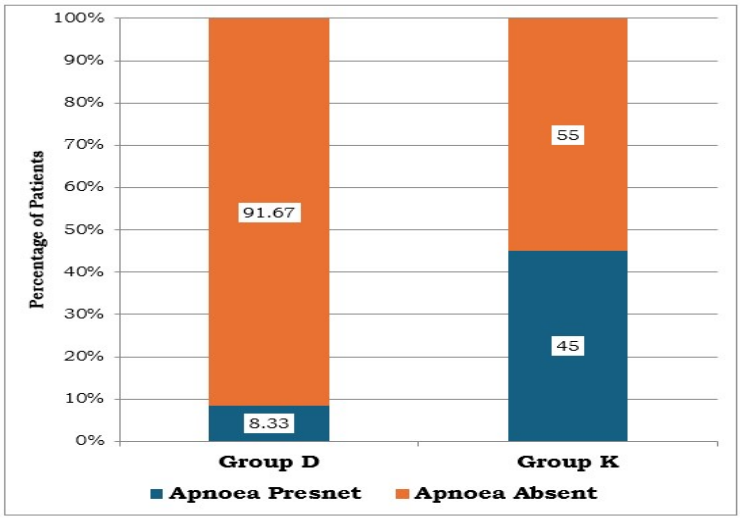


**Figure 3: Comparison of Incidence of Apnoea between Group D (Dexmedetomidine) and Group K (Ketamine)**

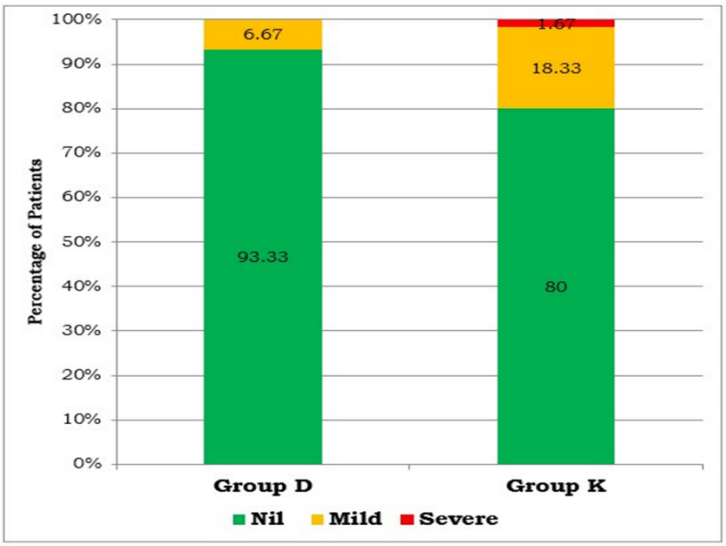


**Figure 4. Comparison of Laryngospasm and movements between Group D (Dexmedetomidine) and Group K (Ketamine)**

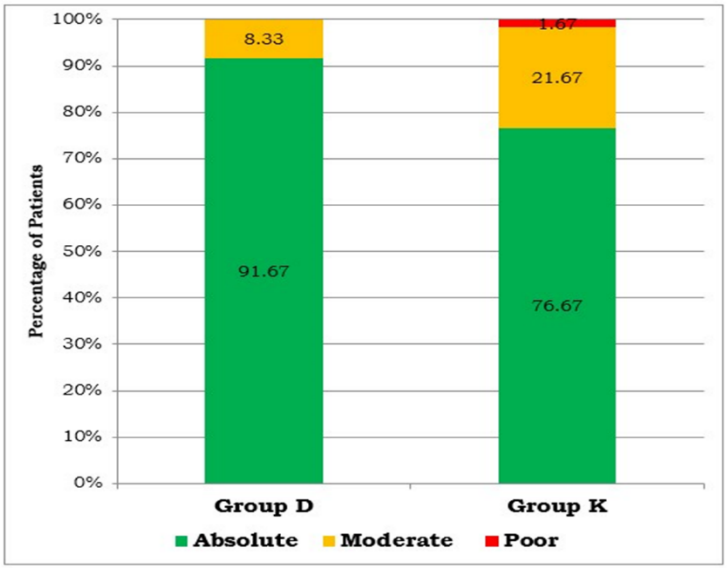


**Figure 5: Comparison of Jaw Relaxation between Group D (Dexmedetomidine) and Group K (Ketamine)**

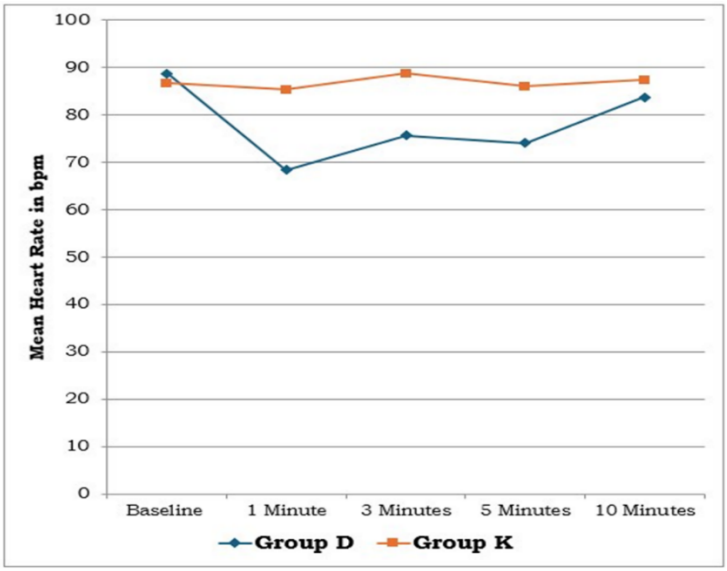


**Figure 6: Comparison of Heart Rate between Group D (Dexmedetomidine) and Group K (Ketamine)**

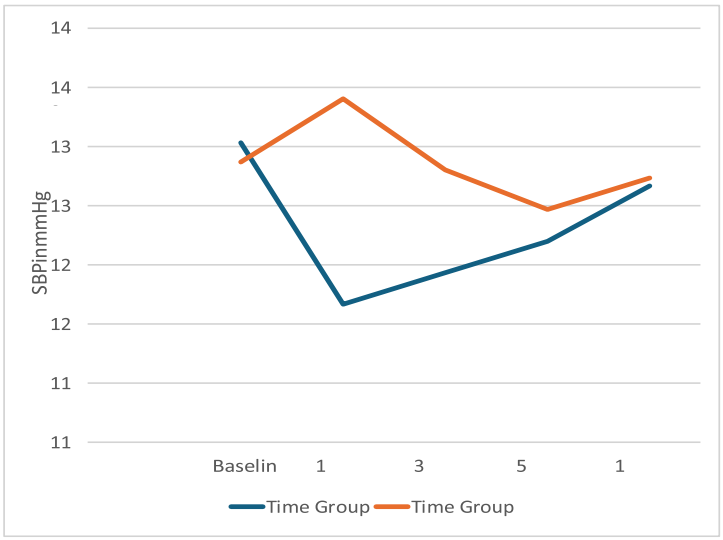


**Figure 7: Comparison of Systolic Blood Pressure (SBP) between Group D (Dexmedetomidine) and Group K (Ketamine)**

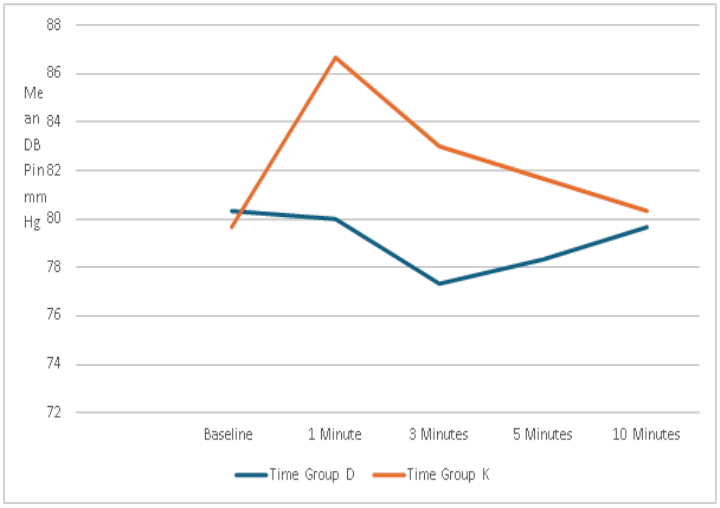


**Figure 8. Comparison of Diastolic Blood Pressure (DBP) between Group D (Dexmedetomidine) and Group K (Ketamine)**

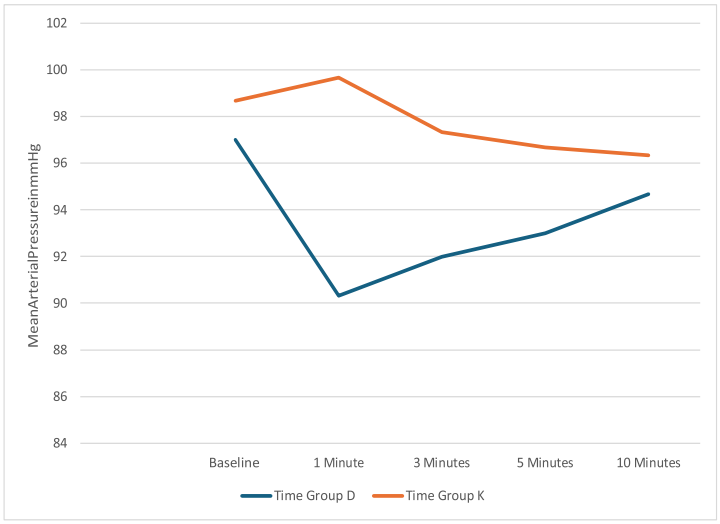


**Figure 9: Comparison of Mean Arterial Pressure (MAP) between Group D (Dexmedetomidine) and Group K (Ketamine)**

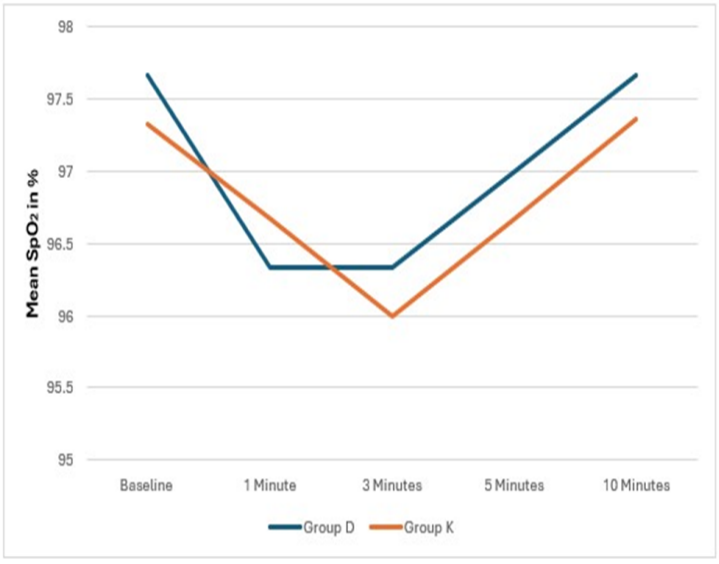


**Figure 10: Comparison of Peripheral Oxygen Saturation (SpO2) between Group D (Dexmedetomidine) and Group K (Ketamine)**

## Discussion

The study highlights the distinct perioperative characteristics of dexmedetomidine and ketamine in terms of sedation quality, airway management, and adverse effects. Dexmedetomidine demonstrated a significant reduction in propofol requirements, indicating superior sedative efficiency. The reduced incidence and shorter duration of apnoea further underscore its respiratory safety profile, making it a suitable choice for patients at risk of respiratory complications. However, the increased prevalence of adverse effects such as bradycardia and hypotension in the dexmedetomidine group necessitates vigilant hemodynamic monitoring. Although jaw relaxation was slightly better with dexmedetomidine, the difference was not statistically significant, suggesting comparable efficacy between the drugs for airway management [7,8].

Conversely, ketamine offered excellent insertion conditions in a higher percentage of cases and was associated with shorter surgery durations. These findings affirm ketamine's utility in procedures requiring rapid onset and efficient airway management. However, the increased incidence of apnoea, myoclonic movements, and tachycardia raises concerns about its respiratory and cardiovascular safety, particularly in patients with compromised function. While its dissociative anesthetic properties are advantageous for analgesia and amnesia, the potential for heightened airway secretions and delayed recovery necessitates cautious use. Notably, both drugs exhibited comparable rates of adverse effects overall, with each demonstrating distinct safety profiles [9,10].

The study aligns with prior research emphasizing dexmedetomidine's sedative and hemodynamic stability benefits and ketamine's rapid induction properties. Findings regarding dexmedetomidine’s minimal respiratory depression and better suppression of the sympatho-adrenal response during airway device insertion corroborate earlier reports [11,12]. Ketamine’s higher apnoea rates and cardiovascular stimulation were similarly noted in other studies, underscoring the importance of tailoring drug choice to patient-specific needs. Together, the results reaffirm the clinical utility of both agents while advocating for individualized perioperative management based on patient profiles and procedural demands.

## Conclusion

Airway management remains a cornerstone skill for anesthesiologists, and the development of supraglottic airway (SGA) devices has significantly improved patient outcomes by mitigating complications associated with endotracheal intubation. The study compared dexmedetomidine and ketamine as pre-treatment drugs under propofol anesthesia to optimize I-gel® insertion conditions in non-paralyzed patients undergoing general anesthesia. Both groups demonstrated comparable demographic and anthropometric profiles, ensuring a balanced comparison. The use of dexmedetomidine and ketamine influenced parameters such as jaw relaxation, laryngospasm, and propofol dosage requirements, highlighting their roles in improving airway management during surgery. These findings underscore the importance of selecting appropriate co-induction agents to enhance the safety and efficacy of SGA device placement. Further research may refine sedative protocols and expand their applicability in diverse patient populations and clinical scenarios.

## References


1. Uzümcügil F, Canbay O, Celebi N, Karagoz AH, Ozgen S. Comparison of dexmedetomidinepropofol vs. fentanyl-propofol for laryngeal mask insertion. Eur J Anaesthesiol. 2008; 25:675– 80.
2. The journal of emergency medicine October 2011 Volume 41, Issue 4, Pages 369–373
3. Ward, C. S., John T. B. Moyle, and Andrew Davey. Ward's Anaesthetic Equipment. London: W.B. Saunders, 1998
4. Liew GH, Yu ED, Shah SS, Kothandan H. Comparison of the clinical performance of i-gel, LMA Supreme and LMA ProSeal in elective surgery. Singapore Med J. 2016; 57:432–7
5. Gupta A, Kaur S, Attri JP, Saini N. Comparative evaluation of ketamine-propofol, fentanylpropofol and butorphanol-propofol on haemodynamics and laryngeal mask airway insertion conditions. J Anaesthesiol Clin Pharmacol. 2011; 27:74–8.
6. Jang YE, Kim YC, Yoon HK, Jeon YT, Hwang JW, Kim E, Park HP. A randomized controlled trial of the effect of preoperative dexmedetomidine on the half maximal effective concentration of propofol for successful i-gel insertion without muscle relaxants. Journal of anesthesia. 2015 Jun; 29:338-45.
7. Vuyk J, Sitsen E, Reekers M. Intravenous anaesthetics. In: Ronald D, Miller, editors. Miller’s Anaesthesia. 8th ed. Philadelphia: Elsevier Churchill Livingstone; 2015. pp. 821–63.
8. Jang YE, Kim YC, Yoon HK, Jeon YT, Hwang JW, Kim E, et al. A randomized controlled trial of the effect of preoperative dexmedetomidine on the half maximal effective concentration of propofol for successful i-gel® insertion without muscle relaxants. J Anesth. 2015; 29:338–45.
9. Yoo JY, Kwak HJ, Kim YB, Park CK, Lee SY, Kim JY. The effect of dexmedetomidine pretreatment on the median effective bolus dose

of propofol for facilitating laryngeal mask airway insertion. J Anesth. 2016; 31:11–7.

**10.** Billard V, Moulla F, Bourgain JL, Megnigbeto A, Stanski DR. Hemodynamic response to induction and intubation. Propofol/fentanyl interaction. Anesthesiology. 1994; 81:1384–93.

**11.** Suzuki M, Tsueda K, Lansing PS, et al. Small-dose ketamine enhances morphine-induced analgesia after outpatient surgery. Anesth Analg 1999; 89: 98–103

**12.** Belleville JP, Ward DS, Bloor BC, Maze M. Effects of intravenous dexmedetomidine in humans. I. Sedation, ventilation, and metabolic rate. Anesthesiology 1992; 77: 1125–33