

A Comparative Study Between Effects Of Ketamine And Fentanyl As Co-induction Agents With Propofol For I-Gel Insertion In Minor Surgical Procedures.

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Abstract

Background: The study aimed to compare and determine the success rate, ease of introducing I-gel and the hemodynamic effects of two adjuvant drugs ketamine and fentanyl, when used with induction agent propofol in minor surgical procedures.

Methodology: The study comprised of 68 patients of ASA-I & II grading of either gender, aged between 18 to 60 years undergoing minor surgical procedures. Patients were distributed into two groups.

Group K- inj. ketamine 0.5mg/kg & inj. propofol 2mg/kg

Group F- inj. fentanyl 1mcg/kg & inj. propofol 2mg/kg

Results: Both groups K and F were comparable in terms of baseline clinic-sociodemographic variables such as age, gender, weight, ASA grade and Mallampatti grade. Attempt of insertion was more than one in 26.5% cases of group K and 8.8% cases of group F, showing statistically insignificant difference ($p > 0.05$). Jaw relaxation was significantly good in group F than group K ($p < 0.01$). Incidence as well as severity of coughing and limb movement was much higher in group K than group F ($p < 0.01$). Overall excellent significantly higher condition was observed. Excellent conditions seen in 85.3% and 50% cases belonging to group F and group K respectively ($p < 0.01$).

Mean total requirement of propofol was 124 ± 24.56 and 110.06 ± 18.95 in cases belonging to groups K and group F respectively. Thus showing significant difference. Hemodynamic parameters such as heart rate (HR) and blood pressure (BP) were significantly higher in group K than in group F following induction ($p < 0.01$).

Conclusion: Fentanyl when used as co-induction drug with propofol provides ideal condition for I-gel insertion, decreases total requirement of propofol & stable hemodynamic response as compared to ketamine & propofol.

Keywords: I-GEL insertion, ketamine, fentanyl, propofol, hemodynamic

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Introduction

Maintaining the patency of airway during the surgical procedure is one of the important task for the anesthesiologist.^[1] Supraglottic airways (SGA) are useful during surgical procedures to maintain airway, allowing ventilation, oxygenation as well as delivering anesthetic gases obviating the need of endotracheal intubation.^[2]

Recently I-gel a novel airway device which is transparent, soft gel-like device made up of styrene ethylene butadiene styrene (SEBS)- a medical grade thermoplastic elastomer, fits snugly on the perilaryngeal structures and create anatomical seal which is non inflatable. I-Gel has an integrated gastric channel which facilitates venting of gas from the stomach and also allow the passage of a nasogastric tube so that the contents of stomach can be emptied.^[3]

The time required for I-Gel insertion is shorter with intravenous anesthetics as compared to inhalational anesthetics. Propofol a non-opioid, non-barbiturate, sedative-hypnotic agent with rapid induction and recovery time, antiemetic effect and potential suppressor effects on upper airway reflexes is the agent of choice. However, when used as a sole induction agent higher doses are required for I-Gel insertion and is associated with certain side effects such as hypotension, bradycardia, pain on injection and patient movement which is not desirable in many clinical conditions.^[4,5,6] Hence, co-inducing agents such as ketamine and fentanyl with propofol are known to reduce the dose of propofol.^[6]

Ketamine, is a N-methyl D-aspartate (NMDA) antagonist causing little or no cardiorespiratory depression and has analgesic properties which are lacking in propofol.

Fentanyl, a synthetic opioid agonist is a phenylpiperidine derivative which has rapid onset but short duration of action and in addition to have been known to reduce the dose of propofol and provides optimal I-Gel insertion conditions with significantly better haemodynamic stability.^[7,8]

Hence we compared the success rate, ease of introducing I-Gel and the hemodynamic effects following two adjuvant drugs ketamine and fentanyl used with propofol in minor surgical procedures.

Aims and Objectives

Aim:-

The aim of this study is to compare and determine the success rate and ease of introducing I-Gel and the hemodynamic effects of two adjuvant drugs ketamine

and fentanyl, when used with induction agent propofol in minor surgical procedures.

Objectives

- To determine number of attempts and assess the ease for I-Gel insertion.
- To determine the total effective dose of propofol required for successful I-Gel insertion in patients co-induced with either ketamine or fentanyl.
- To compare various adverse effects like coughing, gagging, limb movements and laryngospasm during I-Gel insertion.
- To study the hemodynamic changes which occur during I-Gel insertion when propofol is used with either ketamine or fentanyl.

Materials and Methods

The present was conducted in Department of Anesthesiology, S.B.K.S. Medical Institute and Research Centre, Sumandeep Vidyapeeth University, Piparia, Waghodia, Vadodara, Gujarat on 68 patients aged between 18 to 60 years old undergoing elective minor surgical procedure.

Inclusion Criteria:

- Patients willing to participate in study and giving written consent.
- American Society of Anaesthesiologist (ASA) grade I and II patients.
- Aged 18-60 years of either gender.
- Patients scheduled to undergo elective surgical procedure.
- Duration of surgery not exceeding > 1hr.
- Mallampatti classification 1 and 2.
- Mouth opening >3cm.

Exclusion Criteria:

- Patient undergoing oral surgeries.
- Patients having trismus.

- Patients having systemic diseases.
- Patients with any condition which may increase the risk of a full stomach e.g. hiatus hernia, morbid obesity, gastro esophageal reflux disease, pregnancy or a history of upper gastro-intestinal surgery etc.
- Patients having past history of allergic reaction to either of drugs.

Methodology

After obtaining approval from Institute's ethical committee, all the patients fulfilling the inclusion criteria were selected and written and informed consent was obtained. Pre-operative examination was done on the previous day of surgery and routine investigations were carried out. All the selected patients were kept fasting 8 hours night before surgery.

The patients were allocated into two groups.

- **Group K-** Patients were given Inj. Ketamine 0.5mg/kg and Inj. Propofol 2mg/kg
- **Group F-** Patients were given Inj. Fentanyl 1mcg/kg and Inj. Propofol 2mg/kg.

Procedure

Patients were shifted to operation theatre (OT) and multi-parameter monitors were attached and recorded. The patients were then pre-medicated with Inj. Glycopyrrolate 0.004mg/kg, Inj. Ondansetron 0.1mg/kg and Inj. Midazolam 0.05mg/kg intravenously (i.v). After pre-oxygenation with 100% oxygen for 5 minutes, patients in Group K were given Inj. Ketamine 0.5mg/kg i.v and patients in Group F were given Inj. Fentanyl 1mcg/kg i.v. This was followed immediately by Inj. Propofol 2 mg/kg i.v over 15 seconds. If required, further increments of Inj. Propofol 0.5 mg/kg i.v was given every 30 seconds until loss of consciousness and loss of eyelash reflex occurred.

After 60 seconds of completion of injection propofol I-gel was inserted. Patients were kept on spontaneous respiration. Anaesthesia was maintained with O₂ (oxygen) 40%, N₂O (nitrous oxide) 60% and isoflurane and vitals were recorded before induction and immediately after induction of anaesthesia and at 0, 3, 5, 10 and 30 minutes after insertion of I-gel.

At the end of surgery, I-gel was removed when the patients were easily arousable and were able to open mouth following verbal commands after gentle suctioning.

Statistical Analysis

- Data was grouped and expressed as frequency and percentage whereas numerical data was expressed as mean and standard deviation.
- Chi square test was applied to assess the difference in proportions of two groups whereas independent t test was applied to assess the difference in mean of two groups. S

Observation and Results

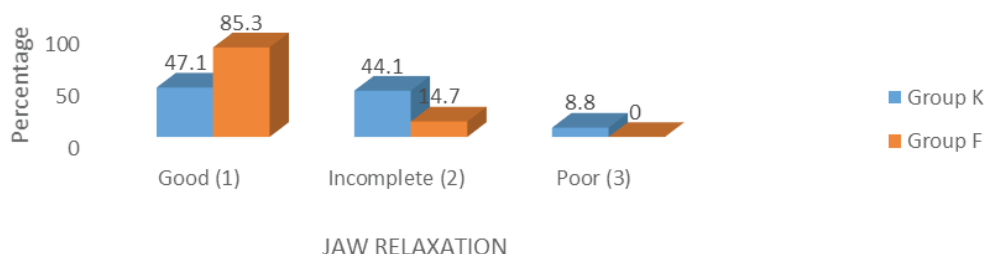
There was no statistical difference between the demographic data (age, gender, weight, ASA grading) between the two groups.

Single attempt of insertion was noted in 73.5% and 91.2% cases in group K and group F respectively, whereas 2 attempts were noted in 26.5% and 8.8% cases in group K and group F respectively. The difference in number of attempts was statistically insignificant ($p > 0.05$).

Ease of I-gel insertion based on Jaw relaxation according to Young's criteria^[9] between two groups

In our study, we observed that ease of I-gel insertion was good in significantly higher proportion of patients of group F as compared to group K. ($p < 0.01$) as shown in Chart 1.

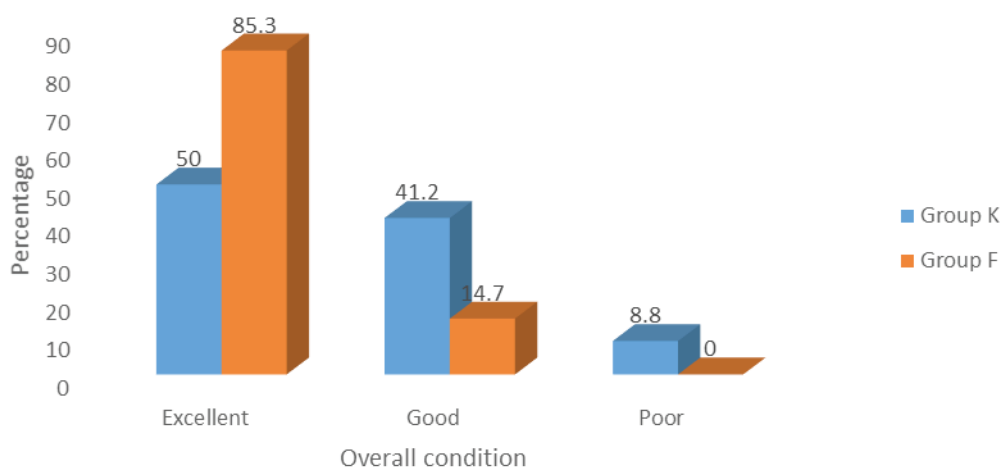
Chart 1- Comparison of Jaw relaxation according to Young's criteria between two groups



Comparison of overall condition of patients as per Lund and Stovener criteria^[10] of two groups

Our study showed that group F had overall excellent condition which was significantly higher in proportion ($p < 0.01$) as shown in chart 2.

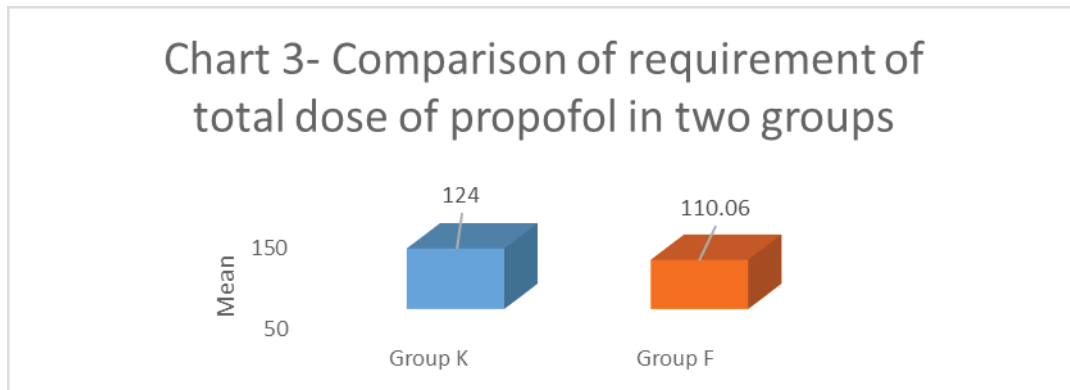
Chart 2- Comparison of overall condition of patients of two groups



Observations	Score
No gagging or coughing, no patient movement or laryngospasm	Excellent
Mild to moderate gagging, coughing or patient movement with no laryngospasm	Good
Moderate to severe gagging, coughing or patients movement with no laryngospasm	Poor
Severe gagging, coughing or patient movement or Laryngospasm	Unacceptable

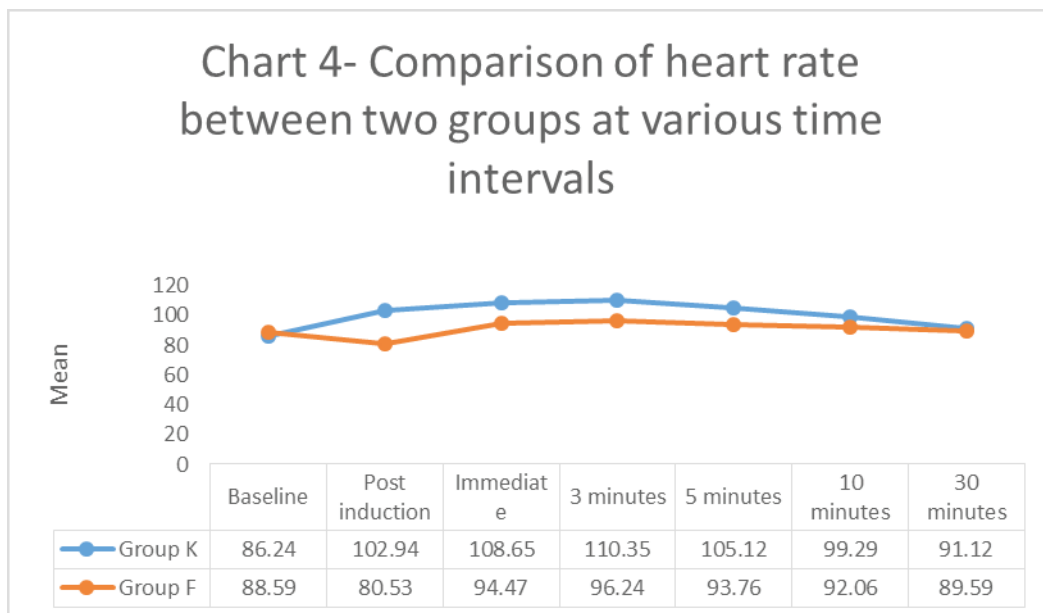
- Comparison of requirement of total dose of propofol in two groups

Overall, the total dose of propofol required was significantly less in group F as compared to group K ($p < 0.01$) as seen in chart 3.



- **Comparison of heart rate between two groups at various time intervals**

Baseline mean heart rate was comparable between two groups ($p > 0.05$). However, after induction, mean heart rate was observed to be significantly higher in group K as compared to group F upto 10 minutes following induction ($p < 0.05$) as seen in chart 4



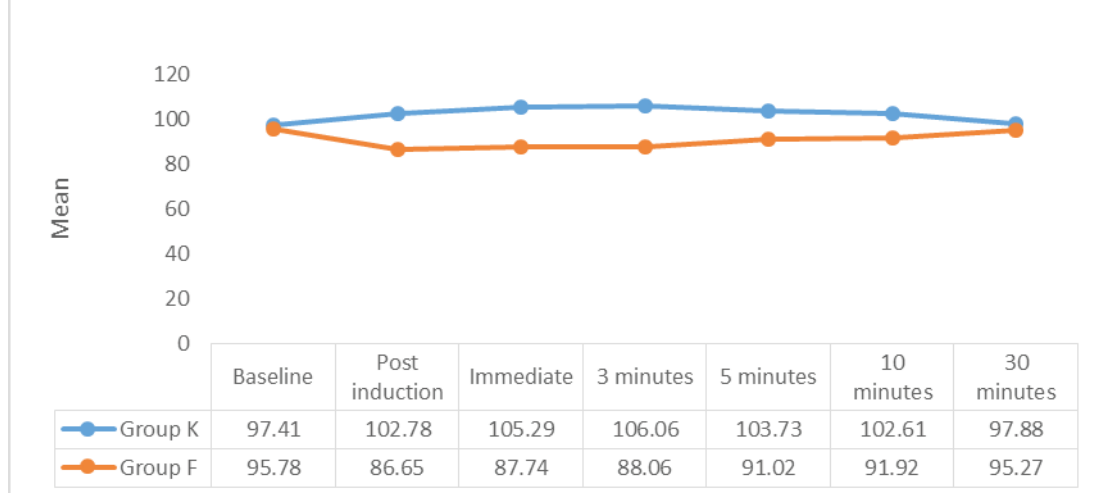
- Comparison of mean arterial blood pressure between two groups at various time intervals.

In our study, mean baseline systolic, diastolic blood pressure and mean arterial pressure was comparable between two groups ($p > 0.05$).

However, after induction, mean SBP and DBP and MAP were observed to be significantly higher in group K as compared to group F upto 10 minutes following induction ($p < 0.01$).

At 30 minutes of induction, difference in mean SBP, DBP and MAP between two groups were statistically insignificant ($p > 0.01$) as shown in chart 5.

Chart 5- Comparison of mean arterial blood pressure between two groups at various time intervals



In our study, mean oxygen saturation remained more than 99% throughout the observation period and two groups were comparable with respect to mean SPO2 ($p > 0.05$).

Discussion

Here, in our study, we compared and determined the success rate and ease of I-Gel insertion using Fentanyl in one group & Ketamine in other group followed by Propofol as they both possess adequate analgesic property at sub-anaesthetic doses.

Attempt of Insertion

It was observed that I-Gel was inserted in single attempt in 73.5% cases and 91.2% cases of group K and group F respectively, but the difference was statistically insignificant.

The outcomes in our study were concordant with the findings of Gupta A et al (2011)^[11] and Nagalakshmi P et al (2018)^[12] in which number of attempts were more than 1 in 60% and 70% patients of group Propofol-Ketamine, respectively. Single attempt of insertion was seen in 43.33% and 80% patients in Group Propofol-Fentanyl respectively. However the observed variation was statistically insignificant.

Ease of Insertion

Ease of insertion was assessed using Jaw relaxation according to Young's criteria. Use of fentanyl as an adjuvant with propofol for I-gel insertion was significantly associated with good jaw-relaxation than that to use of ketamine as an adjuvant in our study ($p < 0.01$). The findings of our study were supported by Rustagi PS et al and Gupta A et al where they concluded that jaw relaxation was with fentanyl with propofol as compared to dexmedetomidine and ketamine with propofol respectively.

Overall Condition of Patients

Lund and Stovener criteria^[10] was used to assess the overall condition of the patients of 2 groups. Group F was significantly associated with excellent condition in 85.3% of cases whereas group K had 50% cases with excellent conditions. Overall condition was thus significantly better in group F than that of group K ($p < 0.01$).

Similarly, Singh R et al (2011) and Gupta A et al (2011) also documented significantly better overall

conditions in the fentanyl group than the ketamine group ($p < 0.01$).^[14,11] These findings were in concordance with the findings of present study. This could be attributed to significantly better jaw relaxation and lower incidence of limb movements, and coughing/gagging in fentanyl group as compared to ketamine group which are main criteria used in this classification.

Dose of Propofol

As stated earlier, use of propofol alone for I-gel insertion require greater quantity of propofol and thus there is need of adjuvant to improve the insertion condition of

I-gel. Opioids such as fentanyl and NMDA antagonist such as ketamine are used as an adjunct with propofol to reduce the dose and associated side effects of propofol.

In our study, mean dose of propofol requirement was significantly higher in patients belonging to group K (124 ± 24.56) as compared to patients of group F (110.06 ± 18.95).

Similar to our study, **Gupta A et al (2011)** and **Nagalakshmi P et al (2018)** documented that patients of ketamine group had greater requirement of propofol for inserting laryngeal mask airway in comparison to the other two groups.^[11,12]

Hemodynamic Variables

Heart rate, blood pressure and oxygen saturation were assessed throughout the procedure.

Heart Rate

In our study, mean HR at baseline was comparable between two group whereas mean HR post induction, and immediately after I-gel insertion till 10 minutes was significantly higher in group K than in group F ($p < 0.05$). After 30 minutes of induction, mean HR settled in group K and difference in mean HR between two groups was statistically insignificant ($p > 0.05$).

The observations in our study were concordant with the findings of **Gupta A et al (2011)** in which mean heart rate was significantly higher in cases of propofol-ketamine group than those of fentanyl-propofol group

($p < 0.05$) post induction.^[11]

Sagir et al (2013) however documented significantly better hemodynamic stability in ketamine-propofol group than to fentanyl propofol group which was contrasting to the findings of present study.^[15]

Blood Pressure

In our study, mean SBP, DBP and MAP was significantly increased in group K following induction and the difference was significant upto 10 minutes following induction. However, after 30 minutes, the difference between two groups was comparable.

These findings were concordant to findings of **Gupta A et al (2011)**^[11] and **Goh PK et al (2003)**^[13] in which mean SBP, DBP, MAP was significantly higher in patients co-induced with ketamine than those co-induced with fentanyl ($p < 0.01$).

Oxygen Saturation

In our study mean oxygen saturation remained more than 99% throughout the observation period and two groups were comparable with respect to mean SPO₂ ($p > 0.05$).

Conclusion

Fentanyl when used as co-induction agent with propofol provides absolute jaw relaxation and excellent conditions for I-Gel insertion with reduction in total dose of propofol and stable hemodynamic response as compared to Ketamine & Propofol. So, FENTANYL is better adjuvant with PROPOFOL for I-Gel insertion.

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Conflict of Interest- None

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