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Original Research Article

Evaluation of Topical Versus Intravenous Lignocaine for Insertion of I-Gel with Propofol: A Comparative, Analytical Study

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Abstract:

Introduction: Insertion of I-Gel for ventilating patients under general anaesthesia requires suppression of airway reflexes and hemodynamic stability. The objective of this comparative analytical study was to compare the ease of insertion of I-Gel following induction of anaesthesia with intravenous propofol preceded by 'topical' lignocaine spray and 'intravenous' lignocaine.

Methods: 60 patients of 18-60years of age of both sexes, ASA Grade I and II who underwent elective surgeries were given Inj. Propofol 2mg/kg IV followed by Inj. Lignocaine 1.5 mg/kg IV over 30 seconds in 30 patients (Group IV) and Lignocaine aerosol 10% 40 mg topically in 30 patients (Group TL). Conditions of I-Gel insertion, gagging, laryngospasm, coughing at time of insertion, ECG, NIBP, SPO2 and EtCO2 were recorded according to scheduled times.

Results: In terms of number of attempts, patient response, airway manipulations, ease of insertion and insertion time, patients' airway secured with I-Gel in group TL vs group IV in (96.67% vs 73.33%, 93.33% vs 66.67%, 93.33% vs 66.67%, 93.33% vs 66.67%, 12.13sec vs 13.60sec respectively) which was found to be statistically significant ($p<0.05$).

Conclusions: Topical Lignocaine 10% aerosol prior to propofol induction provided excellent conditions for I-Gel insertion with minimal patient response and minimal requirement of airway manipulations.

Keywords: I-Gel; lignocaine aerosol; lignocaine IV; propofol.

Introduction

I-Gel™,(2007) supraglottic airway device (SAD), used in general anaesthesia provides greater stability in haemodynamics[1], intracranial pressure[2] and intraocular pressure[3], higher seal pressure and has high success rate at first insertion[4]. I-Gel insertion requires the suppression of upper airway reflexes to prevent gagging, coughing and laryngospasm.

Different intravenous induction agents have been tried for SAD insertion[5,6]. Propofol when used as a sole induction agent at standard induction doses (2-3mg/kg) often results in failure of insertion of SADs. Several co-induction agents have been used with varying success rates. Lignocaine is a common co-induction agent which obtunds airway reflexes, has cough suppressant effect, reduces cardiovascular response to tracheal intubation and is dose dependent, as shown in previous studies with thiopentone [7,8]. Lignocaine spray in enough doses can cause adequate surface anaesthesia to the larynx and pharynx and its mucosal absorption simulates IV administration [9]. Spraying of topical lidocaine 40 mg over posterior pharyngeal wall has been shown to result in lesser airway manipulations and successful LMA insertion in patients receiving thiopental as induction agent when compared to lidocaine 1.5 $mgkg^{-1}$ IV given as co-induction agent [10].

The purpose of this comparative and analytical study was to compare the ease of insertion of I-Gel and hemodynamic response following induction of anaesthesia with intravenous propofol preceded by 'topical' lignocaine spray versus 'intravenous' lignocaine.

Materials and Methods

This study was conducted in Mysore Medical College and Research Institute, Mysore, during September 2019 to June 2021. Following hospital ethics board approval, 60 patients of age between

18-60 years with ASA grading I/II undergoing elective minor surgeries under General anaesthesia were part of the study.

Patients with restricted mouth opening, cardiac, renal, hepatic, respiratory diseases, obesity, those with neck deformity or mass, and patients undergoing oral surgeries were excluded from the study. All the patients underwent a thorough pre-anesthetic check-up and written informed consent was taken from all patients in their own language. In the OR, IV line was secured and multi-parameter monitoring for Heart rate (HR), systolic blood pressure(SBP), Diastolic blood pressure(DBP), Mean Arterial Pressure(MAP), Oxygen saturation(SpO2), Capnography (EtCO2) and ECG was done.

Basal values were noted before administering the premedication for both the groups. Inj. Glycopyrrolate 5mcg/kg IM half an hour prior to surgery, IV Ondansetron 0.08 mg/kg, IV Midazolam 0.03 mg/kg, IV Pentazocine 0.3 mg/kg.

After pre-oxygenation with 100%oxygen for 3min, patients received Propofol 2.0mg/kg IV over 30 seconds, after 30 seconds I-Gel insertion was attempted using standard technique by the anaesthesiologist who was unaware of the study drugs. Group IV(n=30) - received IV lignocaine 1.5mg/kg over 30sec (45sec prior to Propofol) and Group TL(n=30)- received 2 sprays of lignocaine 10% (10 mg/spray) on either side of oropharynx (total 40 mg) 3min prior to Inj. Propofol.

Ventilation of patient was manually assisted until spontaneous breathing resumed. Anaesthesia was maintained with oxygen, nitrous oxide and isoflurane (0.5-1%).

Patient parameters were noted at baseline, 30sec after Propofol, post I-Gel insertion and at 1, 2 and 3mins. Observations made for number of insertion attempts as I or II, Success/failure of insertion (Successful ventilation present/not). Visible chest movements, Square wave EtCO2 trace, SpO2 above 95% and absence of stridor were considered as criteria for successful ventilation. Time taken for I-Gel insertion was noted as from picking up the device to successful ventilation.

Number and type of airway manipulations required to aid insertion like jaw thrust, chin lift, changing the size of device, increasing the depth of anaesthesia and airway manipulations were noted. Patient response to I-Gel insertion was noted and graded as per Table 1.[4]

Table 1: Grading of patient response to I-Gel insertion

Conditions of LMA insertion	Gagging	Laryngospasm	Coughing
Excellent	Grade 0/1	None	None
Good	Grade 0/2	None	None
Poor	Grade 2	None	Present
Unacceptable	Grade 3	Present	Present

Gagging was graded as Grade 0 - No Gagging, Grade 1 - Gagging settled within 30 secs, Grade 2 - further dose of induction agent required, Grade3 - Suxamethonium was required.

Subjective ease of insertion was graded as Very easy, Difficult and Very difficult. For statistical analysis, assistance received from statistician of our institute. Data was analysed using SPSS 21.0 software. Descriptive parameters were represented as mean with SD or median. Continuous variables were compared using unpaired t test / Mann Whitney u test. Chi-square or t test was used to compare the results of various parameters. Categorical data was represented as frequency with percentage. For all tests, p value of <0.05 was considered as statistically significant. Sample size was calculated using the equation

$$n = \frac{2\sigma^2 \times (Z\alpha + Z\beta)^2}{\delta^2}$$

where α is level of significance (type 1 error) and Zα is the corresponding table value, β is type 2 error and Zβ is the corresponding table value, σ is pooled standard deviation, δ is clinically significant difference. We fix α as 0.05(5%), β as 0.20(20%) so that power (1-β) was 80%.

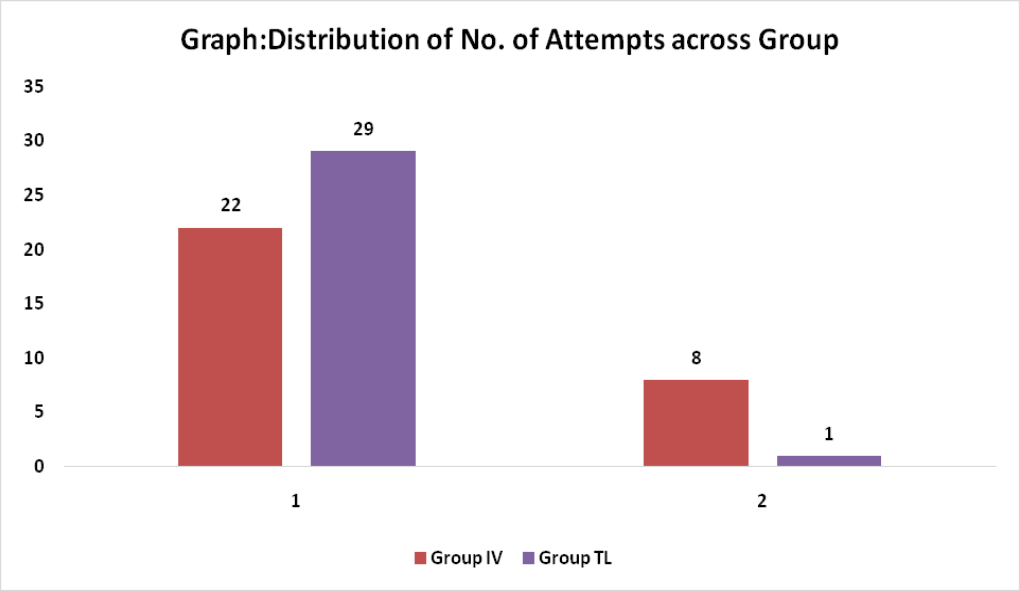
Based on this, minimum number of patients required in each group was 30. Therefore, the sample size was 30 per group.

Results

Both the study groups were comparable with no statistical difference occurring with respect to age, sex and ASA status.

Table 2: Distribution of No. of Attempts across Group

No. of Attempts	Group IV	Group TL	Total
1	22(73.33%)	29(96.67%)	51(85%)
2	8(26.67%)	1(3.33%)	9(15%)
Total	30(100%)	30(100%)	60(100%)
p value - 0.026			

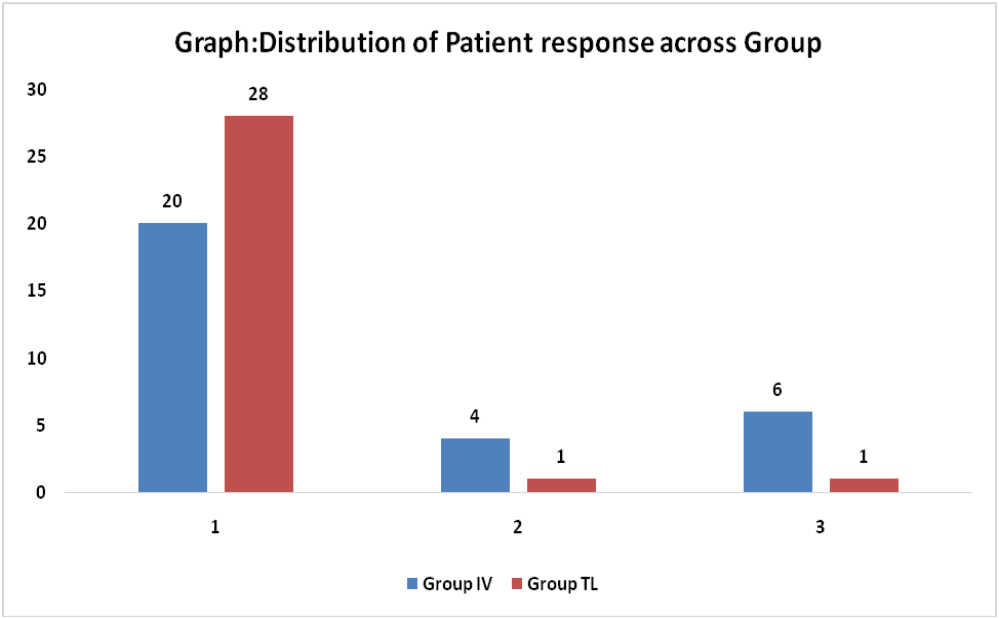


Graph 1: Distribution of No. of Attempts groups

In Group IV, I-gel was inserted at the first attempt in 22 cases and at the second attempt in 8 cases, whereas in Group TL, I-gel was inserted at the first attempt in 29 cases and at the second attempt in 1 case and it is statistically significant with p value <0.05 (p value - 0.026).

Table 3: Distribution of Patient response across Group

Patient response	Group IV	Group TL	Total
1	20(66.67%)	28(93.33%)	48(80%)
2	4(13.33%)	1(3.33%)	5(8.33%)
3	6(20%)	1(3.33%)	7(11.67%)
Total	30(100%)	30(100%)	60(100%)
p value - 0.035			

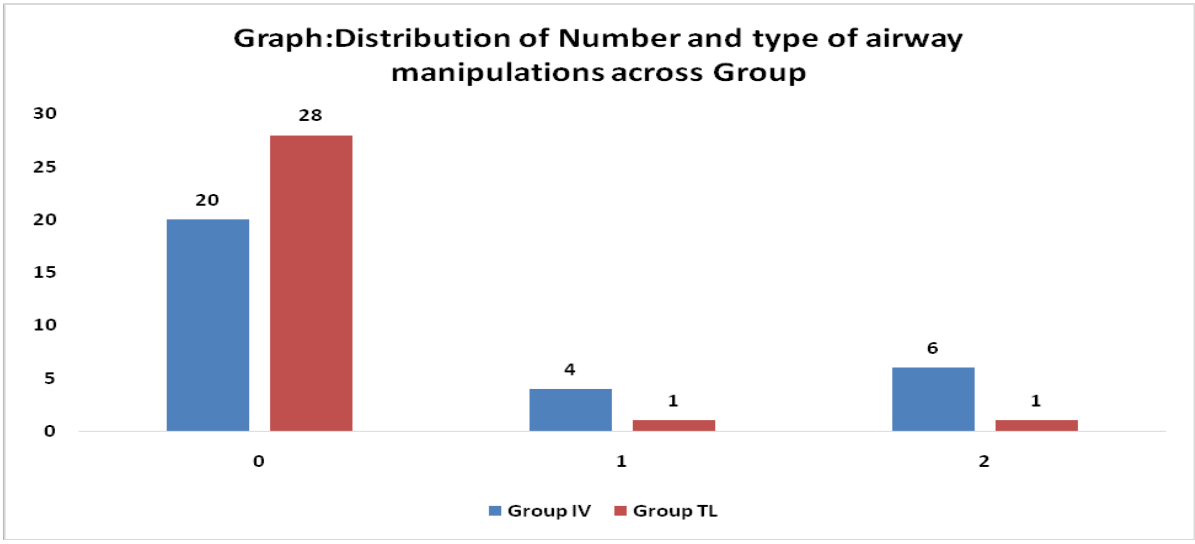


Graph 2: Distribution of Patient response across Group

20 patients in Group IV had no reflex, 4 had gag reflex and 6 patients required more induction agent (Propofol) to suppress gagging whereas in Group TL 28 had no reflex,1 had gag reflex and 1 patient required more induction agent (Propofol) to suppress gagging and it is statistically significant with p value <0.05 (p value - 0.035).

Table 4: Distribution of Number and type of airway manipulations across Group

Number and type of airway manipulations	Group IV	Group TL	Total
0	20(66.67%)	28(93.33%)	48(80%)
1	4(13.33%)	1(3.33%)	5(8.33%)
2	6(20%)	1(3.33%)	7(11.67%)
Total	30(100%)	30(100%)	60(100%)
p value - 0.035			

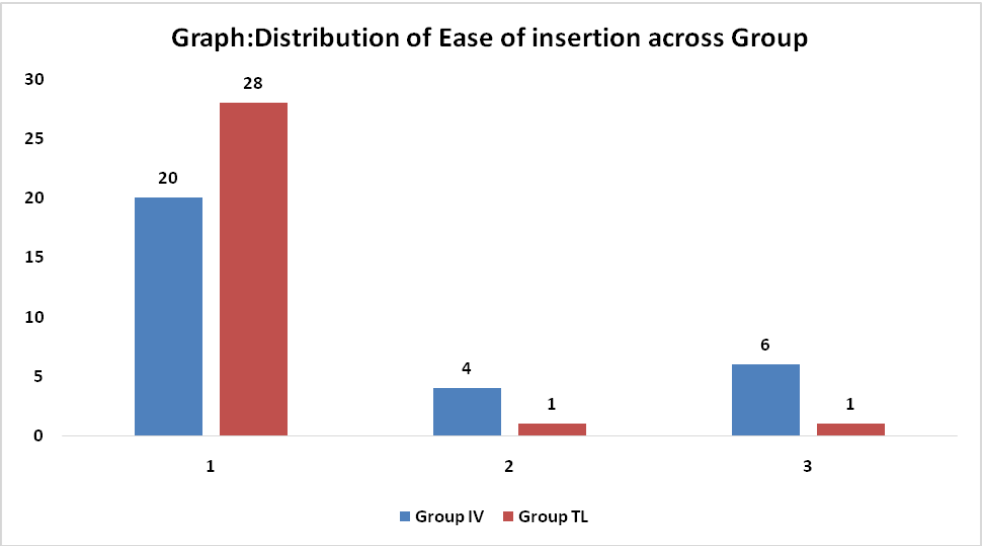


Graph 3: Distribution of Number and type of airway manipulations across Group

20 patients in Group IV required no airway manipulations, 4 needed Jaw thrust and chin lift to insert I-Gel and 6 patients required more induction agent (Propofol) to deepen the plane of anaesthesia, whereas in Group TL required no airway manipulations,1 needed Jaw thrust and chin lift to insert I-Gel and 1 required more induction agent (Propofol) to deepen the plane of anaesthesia and it is statistically significant with p value <0.05 (p value - 0.035).

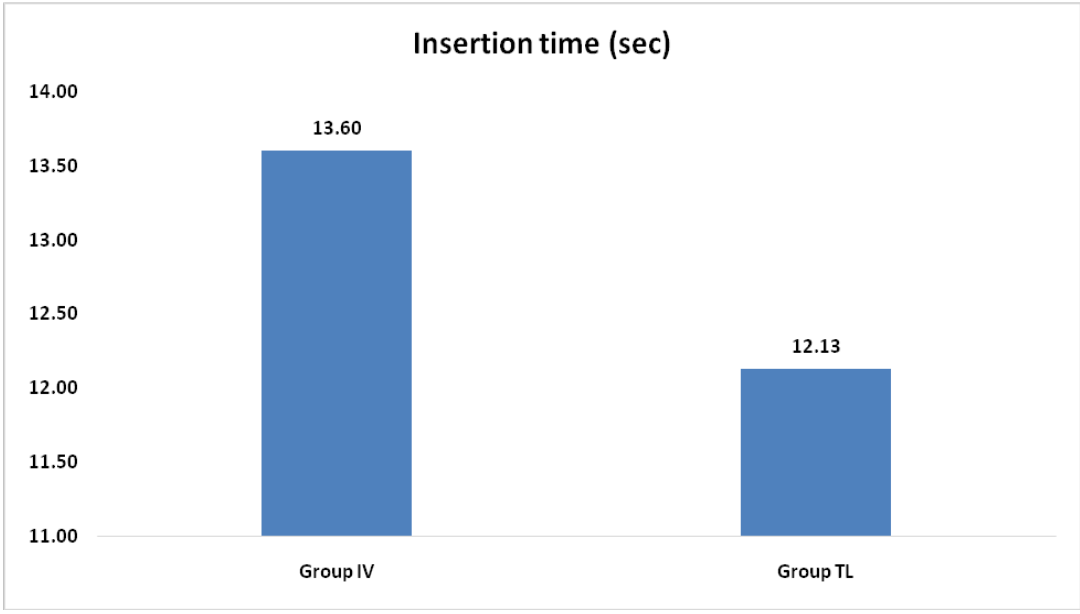
Table 5: Distribution of Ease of insertion across Group

Ease of insertion	Group IV	Group TL	Total
1	20(66.67%)	28(93.33%)	48(80%)
2	4(13.33%)	1(3.33%)	5(8.33%)
3	6(20%)	1(3.33%)	7(11.67%)
Total	30(100%)	30(100%)	60(100%)
p value - 0.035			



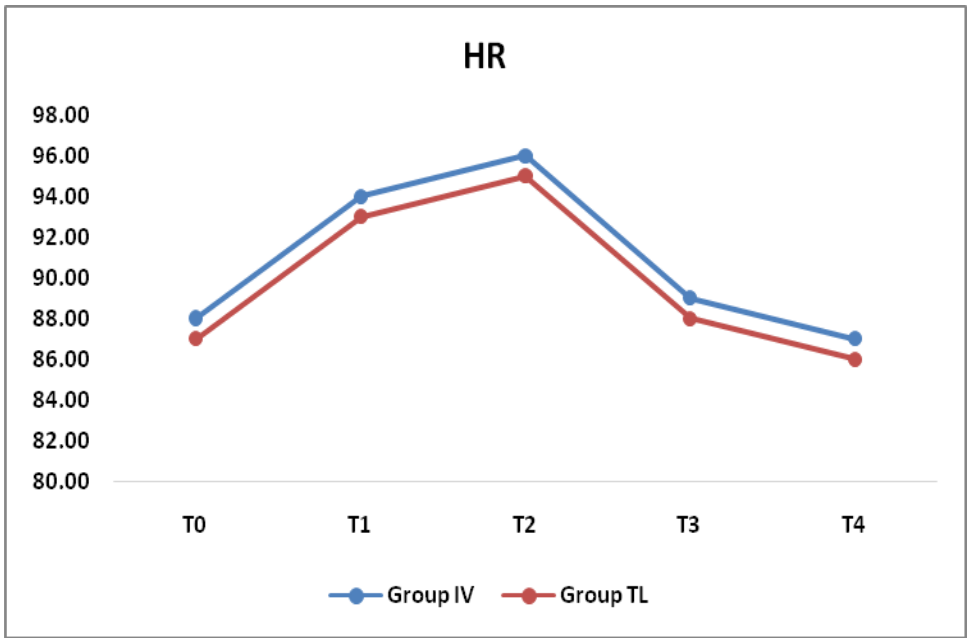
Graph 4: Distribution of Ease of insertion across Group

In Group IV, 20 patients were inserted with I-Gel very easily, in 04 patients it was difficult and in 06 patients insertion of I-Gel was very difficult, whereas In Group TL 28 patients were inserted with I-Gel very easily, in 01 patient it was difficult and in 01 patient insertion of I-Gel was very difficult and it is statistically significant with p value <0.05 (p value - 0.035).



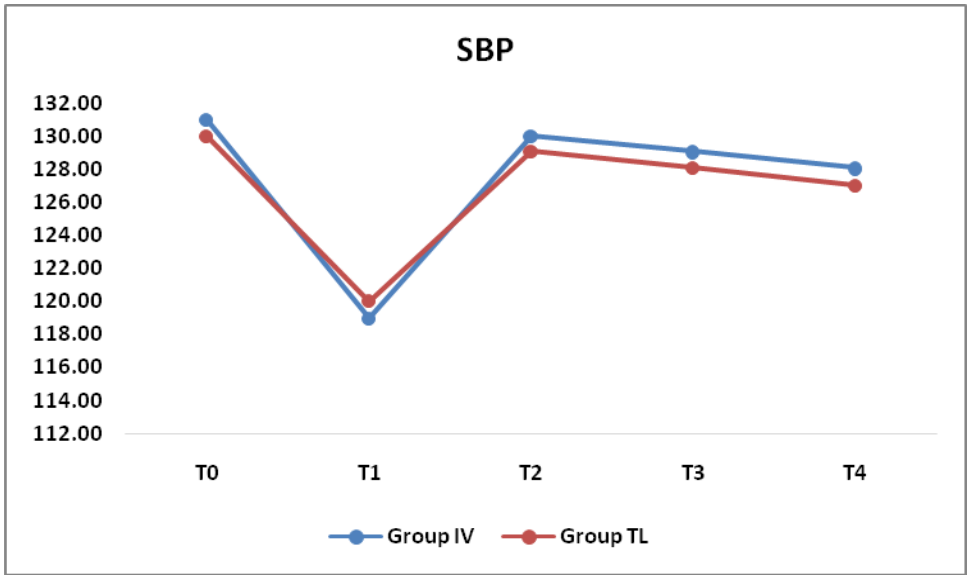
Graph 5: Insertion time comparison among the groups

The mean insertion time required in Group IV was 13.60 sec, whereas in Group TL it was 12.13 sec and it is statistically significant with p value <0.05 (p value - 0.002).

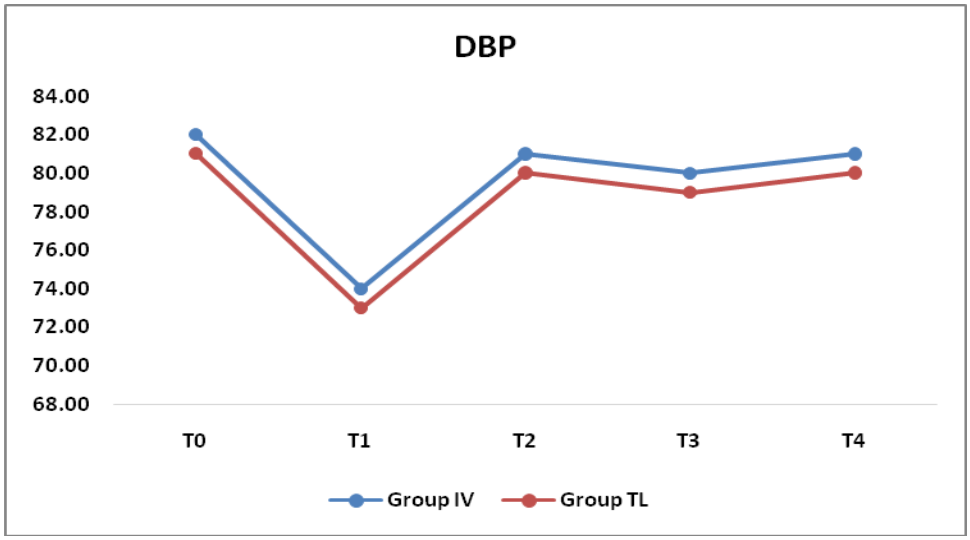


Graph 6: Mean Heart rate comparison among the groups

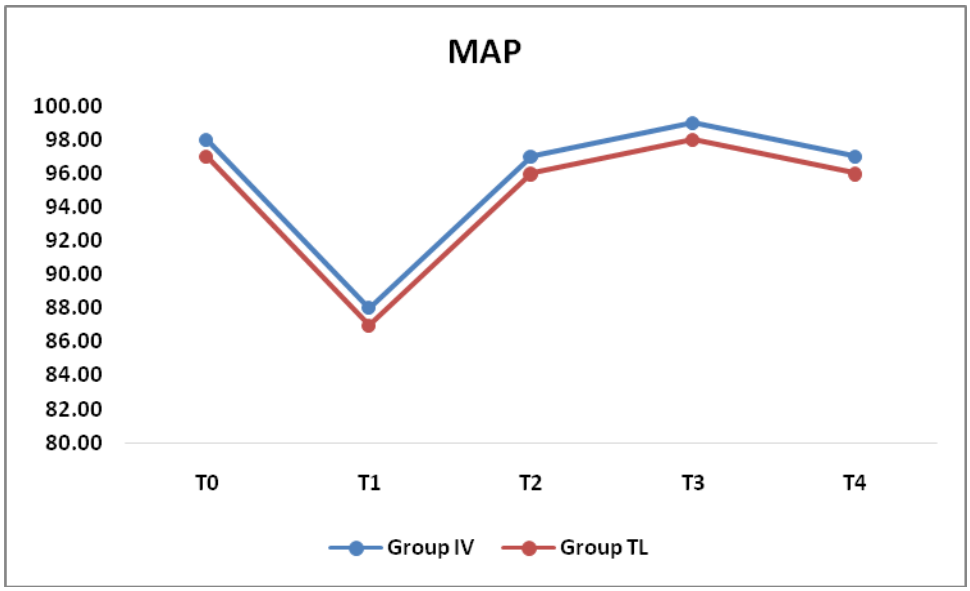
(T0 – Basal value, T1 - At the time of insertion, T2 -1 min, T3- 2min, T4 – 3min). This shows significant rise in mean heart rate post induction in both groups. At two and three minutes post I-Gel insertion, heart rate remains slightly high from baseline but was not significant.



Graph 7: Mean SBP comparison among the groups



Graph 8: Mean DBP comparison among the groups



Graph 9: Mean MAP comparison among the groups

Post induction, significant fall in SBP, DBP, and MAP was seen in both the groups (Graphs 7,8,9). Changes in Blood Pressure at 2 and 3 minutes were slightly lower but not significant.

Discussion

The present study compared the effects of Lignocaine administration– Topical vs Intravenous routes for insertion of I-Gel in terms of haemodynamic stability along with number of insertion attempts, success of insertion, time taken for insertion, number and type of airway manipulations required, patient response to I-Gel insertion and subjective ease of insertion.

Both the groups were comparable in terms of patient characteristics such as age, weight, height, sex and ASA grading.

Reducing the incidence and severity of cough, gagging, laryngeal spasm & cardiovascular response to insertion of SADs is very challenging. The respiratory tract is hypersensitive to stimuli arising during airway manipulation. Laryngeal spasm is a forceful involuntary spasm of laryngeal musculature caused by a sensory stimulation of the superior laryngeal nerve[11]. Lignocaine spray in enough doses by providing high level of stabilization of cell membrane of laryngeal and pharyngeal musculature can cause adequate surface anaesthesia to the larynx and pharynx.

Though IV Lignocaine stabilizes the cell membrane of nerves of larynx and pharynx decreasing their sensitivity to stimulation by I-gel, it is to a degree less than that of spray depending on the dose of lignocaine IV (the higher the dose, the higher degree of stabilization). Although there may be systemic absorption of topical lidocaine administered as an oropharyngeal spray, Mostafa et al.[12] found that the plasma lidocaine concentrations after topical lidocaine 3 mg.kg-1(0.8 ± 0.41 µg.mL-1) were well below the toxic range(5-9 µg.mL-1). We chose to use an even lower dose of topical lidocaine (40 mg) because this dose has been found to be effective in improving SAD insertion conditions[10]. In addition, the topical effect of lidocaine on the pharyngeal wall lasts from 20 to 40min[13], which may allow the patient to tolerate the SAD in the hypopharynx during the transition from intravenous induction to maintenance with an inhaled agent[14].

In the present study, I-Gel insertion conditions in terms of number of attempts, patient response as evaluated by gag reflex and coughing, number and type of airway manipulations (like jaw thrust, chin lift), ease of insertion and mean insertion time were found to be better and statistically significant in Group TL when Lignocaine was sprayed to the posterior pharyngeal wall. However, 3.33% of patients required Jaw thrust and chin lift in Group TL and 3.33% required additional Propofol to deepen the plane of anaesthesia. This result was in accordance to that reported by Cook and Seavell et al[10] comparing topical and intravenous lignocaine with Thiopentone for LMA insertion. In Group TL, number of attempts to pass LMA was also significantly less as compared to Group IV. This was probably due to suppression of airway reflexes by topical lignocaine applied to the posterior pharyngeal wall.

Baseline heart rate was comparable in both the groups. Post induction there was a fall in SBP in both the groups but changes were not significant. Post insertion of I-Gel, SBP increased but was not significant as compared to baseline in both the groups. At 2 and 3min post insertion, SBP changes were not significant. Wilson et al[1] observed that LMA insertion causes transient increase in SBP. Cook and Seveall et al[10] noted no significant difference in SBP post LMA insertion (IV Lignocaine vs Topical Lignocaine). Our findings were consistent with their findings.

The attenuated pressure response was accounted to decreased stimulation by I-Gel and by use of lignocaine with propofol. Post induction there was significant decrease in the DBP ($p<0.05$) which was comparable in both groups. After I-Gel insertion DBP increased but was not significant compared to baseline. These findings were consistent to previous studies[7,8,10,15]. The MAP decreased after induction to a significant level in both the groups which was comparable. When compared intra group this was highly significant ($p<0.001$). There was increase in MAP in both the groups after I-Gel insertion at one minute but that was not significant ($p>0.05$). Similarly at 2 and 3min, the difference of mean from baseline was not significant either intra group or in between two groups ($p>0.05$). These findings were similar to Wood and Forest[16] and was accounted to attenuated pressure response to LMA and lignocaine.

Limitations

Spraying topical lignocaine over the posterior pharyngeal wall may be uncomfortable and increase patients' anxiety which may affect the hemodynamic responses. Sample size of our study was limited and only ASA I and II status patients were enrolled for the study, hence extrapolation of our observation to the general population requires further controlled studies.

Conclusion

The present study demonstrates that 10% topical Lignocaine aerosol sprayed on the posterior pharyngeal wall, 3 minutes prior to propofol induction provides excellent airway conditions with

minimal patient response and minimal requirement of airway manipulations for I-Gel insertion. Haemodynamic stability was the same with topical as well as IV lignocaine.

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