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Original Research Article

I-Gel Insertion Conditions and Hemodynamic Parameters: A Comparison of Injection Propofol and Injection Sodium Thiopentone

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Abstract:

Background and Objectives: General anesthesia's respiratory effects require precise airway management. Laryngoscopy and intubation can induce adverse reflex responses. Supraglottic airway devices (SGADs), like the I-gel, offer alternatives, reducing invasiveness. This study compares I-gel insertion conditions using propofol and thiopental, considering hemodynamic responses and adverse effects. The I-gel is becoming vital in diverse surgical scenarios, making this research significant for effective airway management.

Materials and Methods: This study, conducted at the Gujarat Adani Institute of Medical Sciences (GAIMS) between October 2018 and July 2020, involved 80 ASA grade I and II patients aged 10 to 60 years undergoing elective surgeries. Patients were randomly assigned to either Group P (Propofol) or Group T (Thiopental) for anesthesia induction. The study assessed insertion conditions and monitored hemodynamic parameters. Data analysis was performed using Graph Pad Prism with significance set at $P < 0.05$. This research aimed to determine the preferable agent for anesthesia induction for better insertion conditions during surgeries with spontaneous ventilation and a maximum duration of 2 hours.

Results: Ease of insertion, an essential factor in airway management was reported to be superior with Propofol. Both Propofol and Thiopental induced a drop in blood pressure and heart rate immediately after SGAD insertion. However, there were no significant differences in vital signs and oxygen levels during the post-operative period, indicating that both agents were well-tolerated in this context.

Conclusion: Propofol proved superior for I-gel insertion due to faster induction, better insertion conditions, and minimal adverse effects compared to thiopental, making it the preferred choice for this procedure.

Keywords: Thiopental, Propofol, Laryngoscopy, Intubation, Anesthetics.

Introduction

General anesthesia exerts diverse effects on the respiratory system, encompassing the loss of airway patency, the diminishment of protective airway reflexes, and the onset of hypoventilation or apnea. Integral to general anesthesia is the skill of the anesthetist in preserving a patent airway with minimal sympathetic stimulation and optimal hemodynamic stability [1].

Laryngoscopy and endotracheal intubation, while standard methods for securing the airway, elicit reflex sympathetic responses, leading to heightened plasma catecholamine levels, hypertension, tachycardia, myocardial ischemia, diminished myocardial contractility, ventricular arrhythmias, and intracranial hypertension [2]. The contemporary array of airway devices is broadly categorized into intraglottic and extraglottic devices, serving to safeguard the airway in both elective and emergent scenarios [3]. Endotracheal tube insertion, although regarded as the gold standard for airway management, necessitates a degree of expertise. It presents drawbacks such as potential harm to soft tissues, teeth, vocal cords, larynx, and trachea, as well as an exaggerated hemodynamic response and postoperative discomfort, owing to the requisite laryngoscopy and vocal cord manipulation [4].

In the past decade, supraglottic airway devices (SGADs), exemplified by the I-gel, have emerged as alternatives for airway protection in a variety of surgical contexts [5, 6, 7, 8]. An ideal SGAD should require minimal training for insertion,

provide both spontaneous and controlled ventilation, and permit a lighter plane of anesthesia compared to tracheal intubation [9].

The growing emphasis on day care anesthesia has expanded the utilization of SGADs as alternatives to face masks and, in some instances, tracheal intubation [11]. These devices facilitate ventilation by delivering anesthetic gases/oxygen above the vocal cords, mitigating the disadvantages associated with endotracheal intubation. Their benefits encompass the avoidance of laryngoscopy, reduced respiratory tract invasiveness, improved patient tolerance, ease of placement, enhanced hemodynamic stability upon emergence, reduced incidence of coughing and sore throat, hands-free airway management, and suitability for use by less experienced personnel [12].

One such SGAD is the I-gel (Inter-Surgical), introduced in 2005 as a novel non-inflatable single-use supraglottic airway device [13]. Invented by Dr. Mohammad Nasir in 2007, the I-gel comprises a gel-filled anatomical mask, a gastric drain tube, and lacks an inflatable cuff. This design establishes a non-inflatable seal over the pharyngeal, laryngeal, and perilaryngeal structures, minimizing the risk of compression-related trauma inherent to inflatable supraglottic airway devices, while ensuring post-insertion stability [14].

Propofol has emerged as a common induction agent for SGAD insertion due to its capacity to induce smooth anesthesia and depress airway reflexes, facilitating easier insertion with a reduced incidence of side effects like coughing, gagging, or laryngospasm [15]. However, propofol's cost and potential pain upon injection can be alleviated by mixing it with lignocaine [16, 17].

On the other hand, Sodium Thiopentone (Thiopental), an ultra-short acting intravenous anesthetic induction agent, is an economical alternative frequently used for SGAD insertion. It is readily available, particularly in rural settings [18].

As the insertion of supraglottic airway devices, including the I-gel, is commonly performed without short-acting muscle relaxants, both propofol and thiopental offer suitable insertion conditions. This study endeavors to compare the insertion conditions for the I-gel supraglottic airway device when employing the intravenous induction agents propofol and thiopental. The primary objective is to assess I-gel insertion conditions, while secondary objectives encompass the evaluation of hemodynamic responses to I-gel insertion and the documentation of any adverse effects in both groups.

Materials and Methods

The study was conducted at the Department of Anaesthesiology, Gujarat Adani Institute of Medical Sciences (GAIMS), Bhuj, between October 2018 and July 2020. The research received approval from the institutional ethics committee.

A prospective randomized double-blind study was performed on 80 patients, irrespective of gender, classified as ASA grade I and II, aged between 10 and 60 years, undergoing elective surgical procedures under general anesthesia with spontaneous ventilation in the supine position for a duration not exceeding 2 hours, and with a body mass index (BMI) below 30 kg/m². Informed written consent was obtained from all enrolled patients.

In selecting participants, specific criteria were applied: individuals aged between 10 to 60 years were considered for inclusion, while exclusion criteria encompassed patient refusals, an ASA grade exceeding II, known hypersensitivity reactions to the study agents, the presence of risk factors associated with aspiration such as hiatus hernia or gastroesophageal reflux disease, anticipation of a difficult airway based on criteria like a Mallampatti score greater than 2 or insufficient mouth opening (less than 3 cm), a BMI exceeding 30 kg/m², a history of open eye injury or ophthalmologic disorders, psychiatric conditions including schizophrenia, and pregnancy.

The research employed a computer-generated randomization to assign patients to either Group P or Group T. Prior to anesthesia, comprehensive pre-operative evaluations were conducted, encompassing medical history reviews, physical examinations, and a battery of laboratory investigations. All patients received pre-medications in line with the study protocol. Anesthesia induction was executed with divergent agents corresponding to the group allocation: Propofol for Group P and Thiopental for Group T. Insertion conditions were evaluated according to predefined variables and scoring criteria, while hemodynamic parameters were vigilantly monitored at several time intervals. Relevant time metrics including the duration of surgery, anesthesia, induction, and insertion were meticulously documented. In cases of necessity, rescue anesthetics were administered. Subsequent to surgery, patients were diligently observed for potential adverse effects.

Statistical analyses were performed utilizing Graph Pad Prism – Unpaired student t-test online calculator. The mean and standard deviation were computed for all pertinent variables. The significance of obtained P values was delineated, whereby P values greater than 0.05 were considered insignificant, while those less than 0.05 were deemed significant.

Results

As per our study results, we observed that there was no statistically significant difference in Demographic data (Table 1).

Table 1: Demographic Data

Parameters	Group P (n=40)	Group T (n=40)	P value
Age (years)	27.12 ± 12.29	24.85 ± 12.33	0.4121
Weight (kg)	51.12 ± 11.01	46.7 ± 13.23	0.1804
Gender			
Male	21 (52.5%)	14 (35%)	0.1146
Female	19 (47.5%)	26 (65%)	

Coughing; gagging; head and limb movements were more in Thiopentone group as compared to Propofol group while ease of insertion of I-gel was more in Propofol group. But, After I-gel insertion head and limb movement was far less in Propofol Group as compared to Thiopental Group. Laryngospasm was not observed in any of the patients. So, it was inferred that Propofol provides better insertion conditions for I-gel insertion as compared to Thiopental (Table 2).

Table 2: Comparison of Insertion Conditions

Outcome	Group P (n=40)	Group T (n=40)	P Value
Mouth Opening (n)			
Full=1	37 (92.5%)	33 (82.5%)	
Partial=2	03 (7.5%)	7 (17.5%)	0.33
Nil=3	00 (0%)	00 (0%)	
Gagging/Coughing (n)			
Nil=1	37 (92.5%)	30 (75%)	
Slight=2	03 (7.5%)	10 (25%)	0.02
Gross=3	00 (0%)	00 (0%)	
Swallowing (n)			
Nil=1	34 (85%)	32 (80%)	
Slight=2	06 (15%)	08 (20%)	0.55
Gross=3	00 (0%)	00 (0%)	
Head And Limb Movements (n)			
Nil=1	35 (87.5%)	25 (62.5%)	
Slight=2	05 (12.5%)	15 (37.5%)	0.009
Gross=3	00 (0%)	00 (0%)	
Easiness of Insertion (n)			
Easy=1	34 (85%)	26 (65%)	
Difficult=2	6 (15%)	14 (35%)	0.03
Impossible=3	00 (0%)	00 (0%)	
Laryngospasm (n)			
Nil=1	40 (100%)	40 (100%)	
Partial=2	00 (0%)	00 (0%)	1
Complete=3	00 (0%)	00 (0%)	
Insertion Conditions Summed Score	6.(6-9)	7.(6-10)	0.4205
Attempts (n)			
1	34 (85%)	28 (70%)	
2	6 (15%)	12 (30%)	0.1109
3	00 (0%)	00 (0%)	

Duration of surgery time and Duration of anaesthesia time were comparable in both the Groups (p>0.05) (Table 3).

Table 3: Comparison of Operative Parameters

Intraoperative Parameters	Group P (n=40)	Group T (n=40)	P Value
Induction Time (Sec)	142.7 ± 25.11	192.2 ± 19.63	0.0001
Insertion Time (Sec)	24.92 ± 2.00	27.7 ± 5.15	0.0021
Duration of Surgery (Min)	55.5 ± 14.81	53.25 ± 1.25	0.47
Duration of Anaesthesia (Min)	65.5 ± 14.84	63.25± 13.28	0.48

Our study result shown that Pre-induction baseline heart rate, Systolic blood pressure, Diastolic blood pressure, and mean arterial blood pressure, were comparable in both Groups. Significant fall in these parameters was observed immediately after insertion, at 5- and 10-minutes interval in both Groups ($p<0.05$) (Table 4).

Table 4: Pre-operative Haemodynamic parameters

Heart Rate (bpm)	Group P (n=40)	Group T (n=40)	P Value
Before Induction	85.85 ± 5.44	83.70 ± 5.78	0.0907
After I-gel Insertion	81.90 ± 5.49	80.20 ± 3.73	0.1093
5 Min After Insertion	80.20 ± 4.50	79.07 ± 5.33	0.3087
10 Min After Insertion	80.05 ± 4.71	79.02 ± 4.12	0.3011
SBP (mmHg)			
Before Induction	114.7 ± 6.18	115.55 ± 3.46	0.4501
After I-gel Insertion	107.4 ± 6.02	114.55 ± 3.59	<0.0001
5 Min After Insertion	102.7 ± 5.48	113.15 ± 2.86	<0.0001
10 Min After Insertion	100.9 ± 6.00	112.65 ± 2.76	<0.0001
DBP (mmHg)			
Before Induction	80.9 ± 6.29	79.42 ± 5.05	0.2494
After I-gel Insertion	74.8 ± 5.86	78.0 ± 4.39	0.0071
5 Min After Insertion	73.1 ± 4.98	77.7 ± 4.01	<0.0001
10 Min After Insertion	73.0 ± 4.77	77.2 ± 3.29	<0.0001
MBP (mmHg)			
Before Induction	92.25 ± 3.39	91.46 ± 3.39	0.3005
After I-gel Insertion	85.66 ± 4.32	90.18 ± 3.11	<0.0001
5 Min After Insertion	82.96 ± 3.53	89.51 ± 2.76	<0.0001
10 Min After Insertion	82.30 ± 3.31	89.01 ± 2.14	<0.0001
SPO2			
Before Induction	98.57 ± 0.50	98.50 ± 0.50	0.5331
After I-gel Insertion	98.52 ± 0.50	98.37 ± 0.49	0.1793
5 Min After Insertion	98.57 ± 0.50	98.40 ± 0.50	0.1324
10 Min After Insertion	98.52 ± 0.50	98.55 ± 0.50	0.7892

Postoperative Heart rate, Systolic blood pressure, Diastolic blood pressure and mean arterial blood pressure, were comparable in both Groups. There was no significant difference ($p>0.05$) in postoperative Heart rate, Systolic blood pressure, Diastolic blood pressure among different Groups (Table 5).

Table 5: Post-operative Haemodynamic parameters

Heart Rate (bpm)	Group P (n=40)	Group T (n=40)	P Value
15 Min	82.25 ± 6.16	81.27 ± 6.19	0.48
30 Min	77.35 ± 6.23	78.62 ± 5.95	0.354
60 Min	77.80 ± 4.99	78.12 ± 6.26	0.8011
SBP (mmHg)			
15 Min	112.8 ± 4.98	113.4 ± 3.01	0.5162
30 Min	112.7 ± 5.56	114.3 ± 3.54	0.1288
60 Min	113.2 ± 5.44	113.7 ± 2.50	0.5989
DBP (mmHg)			
15 Min	66.02 ± 4.23	65.10 ± 5.50	0.4043
30 Min	71.75 ± 3.99	70.20 ± 8.01	0.2767
60 Min	71.25 ± 4.80	70.70 ± 5.35	0.6298
MBP (mmHg)			
15 Min	81.61 ± 3.34	81.22 ± 3.63	0.6185
30 Min	85.42 ± 3.26	84.90 ± 5.46	0.6065
60 Min	85.25 ± 3.71	85.03 ± 3.91	0.797
SPO2			
15 Min	98.52 ± 0.50	98.45 ± 0.50	0.5331
30 Min	98.62 ± 0.49	98.65 ± 0.48	0.7828
60 Min	98.47 ± 0.50	98.52 ± 0.50	0.656

Discussion

Supraglottic airway devices (SGADs) have revolutionized airway management in anesthesia and emergency medicine due to their distinct advantages. These devices offer an array of benefits, including swift and straightforward placement, the maintenance of stable hemodynamics during both induction and emergence from anesthesia, improved oxygenation during emergence, and a reduced likelihood of postoperative complications such as sore throats and voice alterations [19, 20].

Propofol, a popular choice among anesthesiologists, is commonly employed as the induction agent for SGAD insertion. It boasts a rapid onset of action, making it an ideal choice for achieving a smooth and efficient induction. One of its key advantages lies in its ability to depress airway reflexes effectively, which, in turn, facilitates the smoother insertion of supraglottic airway devices. On the other hand, Thiopental, while cost-effective and readily available, presents some limitations compared to Propofol. It's considered a less ideal choice due to a higher likelihood of side effects and a less predictable induction process [18].

The study in question involved 80 patients and yielded several noteworthy findings. First, it was observed that Propofol led to significantly shorter induction and insertion times when compared to Thiopental. This reduction in procedural time can be crucial in clinical settings, where time-efficiency is paramount.

Furthermore, the study revealed that Propofol provided better insertion conditions for the SGAD compared to Thiopental. Specifically, it resulted in a higher percentage of patients with full mouth opening and fewer instances of coughing and gagging. Ease of insertion, an essential factor in airway management, was also reported to be superior with Propofol. Both Propofol and Thiopental induced a drop in blood pressure and heart rate immediately after SGAD insertion. However, there were no significant differences in vital signs and oxygen levels during the post-operative period, indicating that both agents were well-tolerated in this context.

In summary, the study's results suggest that Propofol is a superior choice for SGAD insertion. Its faster induction, ability to provide smoother insertion conditions, and comparable hemodynamic effects to Thiopental make it the preferred option for this procedure.

Conclusion

Propofol demonstrated faster induction and shorter insertion times for I-gel placement compared to thiopental. It also provided better insertion conditions and less adverse effects. While propofol caused more immediate hypotension and bradycardia, there were no significant differences in heart rate and blood pressure in the post-operative period. Therefore, propofol appears to be a preferable choice for I-gel insertion due to its improved hemodynamic stability and insertion conditions.

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References

1. Gupta A, Kaur S, Attri JP, Saini N. Comparative evaluation of Ketamine-Propofol fentanyl-Propofol and butorphanol-Propofol on haemodynamics and laryngeal mask airway insertion conditions. J Anaesthesiology Clinical Pharmacology 2011; 27:74-8.
2. Gal TJ. Airway management. In: Miller RD, editor. Textbook of anaesthesia. 6th ed. Philadelphia: Elsevier; 2005. Pp. 1617–52.
3. Jayashree S.et al, Laryngeal mask airway and its variants. Indian J Anaesthesia. 2005; 49:275–80.
4. Shetty AN, Shinde VS, Chaudhary LS et al., A comparative study of various airway devices as regard ease of insertion and haemodynamic responses. Indian j. Anaesthesia. 2004; 48:134-137.
5. Elgebaly AS, Eldabaa AA. Is I-gel airway a better option to endotracheal tube airway for sevoflurane anaesthesia during cardiac surgery? Anesth Essays Res 2014; 8:216-22.
6. Helmy AM, Atef HM, El-Taher EM, Henidak AM. Comparative study between I-gel, a new supraglottic airway device, and classical laryngeal mask airway in anesthetized spontaneously ventilated patients. Saudi J Anaesth 2010; 4:1316.
7. Gibbison B, Cook TM, Seller C. Case series: Protection from aspiration and failure of protection from aspiration with the I-gel airway. Br J Anaesth 2008; 100:415-7.
8. Joshi NA, Baird M, Cook TM. Use of an I-gel for airway rescue. Anaesthesia 2008; 63:1020-1.
9. Siddiqui AS, Raees US, Siddiqui SZ, Haider S, Raza SA. Comparison of performance and safety of i-gel with laryngeal mask airway (classic) for general anaesthesia with controlled ventilation. Anaesth Pain & Intensive Care. 2010; 14:17-20.
10. Amr YM and Amin SM. Comparison of two regimes of Thiopental and Propofol for I-gel supraglottic airway device insertion. Anaesthesia Essays Res. 2010;4: 25-28.
11. Patrick Scanlon, Michael Carey, Michael Power. Patient response to laryngeal mask insertion after induction of anaesthesia with Propofol or Thiopentone. Can J Anaesthesia 1993; 40: 816-818.
12. Vaida S. Airway management - supraglottic airway devices. Timioara, 2004:58-61.

13. Gabbott DA, Beringer R. The I-gel supraglottic airway: A potential role for resuscitation? Resuscitation. 2007; 73:161-2.
14. Levitan RM, Kinkle WC. Initial anatomic investigations of the I-gel airway: A novel supraglottic airway without inflatable cuff. Anaesthesia 2005; 60:1022-6.
15. Yeo Ks, Kau SW, Teoh GS, Onsiong MK. The Use of Thiopentone/Propofol Admixture for Laryngeal Mask Airway Insertion. Anaesthesia Intensive Care. 2001; 29:38:42.
16. Lee TW, Loewenthal AE, Strachan JA, Todd BD. Pain during injection of propofol, the effect of prior administration of thiopentone. Anaesthesia. 1994; 49:817–8.
17. Haugen RD, Vaghadia H, Waters T, Merrick PM. Thiopentone pre-treatment for propofol injection pain in ambulatory patients.
18. Nirmala B.C.A. Comparative Study for Ease of Insertion of Laryngeal Mask Airway with Propofol and Thiopentone Sodium. IOSR Journal of Dental and Medical Sciences. Volume 13, Issue 1 Ver. IX.
19. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. Br J Anaesth 2002; 88:582-4.
20. Cho SA, Sung TY, Cho CK, Jee YS, Kang PS. Optimal propofol dosage for I-gel insertion in healthy paralyzed patients. Korean J Anaesthesiology. 2018; 71:229.