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ORIGINAL ARTICLE

Comparing the use of sevoflurane versus propofol for anesthesia induction during laryngeal mask airway insertion in outpatient urological surgeries.

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ABSTRACT… Objective: To compare the effectiveness of sevoflurane and propofol for anesthesia induction during laryngeal mask airway insertion in outpatient urological surgeries. **Study Design: Randomized Controlled Trial. Setting:** Department of Anesthesia, Fauji Foundation Hospital, Rawalpindi. **Period:** January 2022 to June 2022. **Methods:** A total of 60 patients aging ≥ 18 years, undergoing planned urological procedures were enrolled and randomized into two equal groups of 30 patients each. In Group P, induction was done using intravenous Propofol 2 mg/kg administered over 30 seconds. In Group S induction was done using Sevoflurane (8%) in 100% oxygen via a facemask. After achieving adequate conditions, LMA Classic™ was inserted as per recommended technique. Primary outcomes included, the time for successful insertion of laryngeal mask airway, frequency of apnea and complications related to insertion and the post-induction mean arterial pressure. The outcomes of the two groups were compared by applying Chi-squared test and Independent t-test, taking $p \leq 0.05$ as significant. **Results:** The study participants had a mean age of 41.43±8.24 years, with males comprising 56.66% and females comprising 43.33% of total population. The results of study outcomes show that laryngeal mask airway insertion time was significantly higher in Group S compared to the Group P ($p < 0.0001$). On the other hand, the incidence of apnea and complications related to insertion were significantly higher in Group P compared to Group S ($p=0.03$ & $p=0.02$ respectively). Regarding the hemodynamic findings, a significantly lower mean arterial pressure was observed at 6 minutes after induction in Group P compared to Group S ($p=0.01$). **Conclusion:** Sevoflurane offers fewer complications along with better hemodynamic stability despite longer laryngeal mask airway insertion time compared to propofol for outpatient urological procedures.

Key words: Anesthesia, Laryngeal Mask, Propofol, Sevoflurane, Urological Surgeries.

INTRODUCTION

The surgical procedures performed as outpatient cases have revolutionized the modern healthcare by offering cost-efficiency, reduced hospital stays, and rapid patient recovery.[1] With these advantages, these day-case surgeries have become more common and the data shows an increasing trend at global level during last decade. In China, 17.6% of all surgeries are now performed as day surgery while this ratio becomes 70% at the level of tertiary care hospitals.[2] The outpatient surgeries are now frequently opted for urological procedures, such as cystoscopies, ureteroscopies, and lithotripsies, due to their minimally invasive nature and shorter procedural times.[3,4]

Airway management in anesthesia is crucial for outpatient surgeries, where quick recovery and minimal complications are the key factors. Anesthetic agents therefore must ensure smooth induction, stability during the procedure, and rapid postoperative recovery.[5] The laryngeal mask airway (LMA) offers ease of insertion, minimal airway trauma, and faster recovery, compared to endotracheal intubation. For a smooth LMA insertion, the ideal induction agent should provide rapid induction, adequate jaw relaxation, suppression of airway reflexes, hemodynamic stability, and rapid recovery along with minimal side effects.[6,7]

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Propofol, an intravenous sedative-hypnotic and Sevoflurane, an inhaled volatile anesthetic are among the most commonly used agents for this purpose, however, their comparative effectiveness remains a subject of debate.

Propofol is a preferred agent for a rapid and smooth induction due to its potent hypnotic effects, minimal airway reactivity (causes minimal airway complications such as laryngospasm or coughing), and antiemetic properties. Propofol, therefore, allows a rapid loss of consciousness and provides excellent conditions for LMA insertion. This agent is, however, known for its dose-dependent hypotensive effects, which cause concerns, particularly in patients with cardiovascular (CV) instability. Additionally, apnea and pain on injection site (a commonly reported drawback) are also related to Propofol, which can affect the overall surgical outcomes.[8] Sevoflurane, a volatile anesthetic, is widely used for inhalational induction due to its benefits of rapid onset, minimal airway irritation, and smooth emergence**.** Its particular advantages are mentioned in pediatric and outpatient settings by offering bronchodilation for patients with reactive airways. Sevoflurane provides gradual induction and hemodynamic stability**,** however, may lead to prolonged induction time, excitation movements, and airway irritation, which may cause cough or laryngospasm during induction.[8,9]

Appropriate anesthetic approaches must be adopted to address the specific needs of outpatient urological surgeries. In day-case surgery, the LMA is widely used to ensure spontaneous ventilation and reduce airway stimulation. Making the choice between sevoflurane and propofol is particularly important in this context, to provide rapid induction, hemodynamic stability, and quick recovery for ensuring the same-day discharge.[10]

The lack of definitive data of outpatient urological surgeries in our local population, underscores the need for comparative studies for providing sufficient evidence for adopting patient-centered anesthesia approach. This study was therefore aimed to compare the effectiveness of Sevoflurane and Propofol for anesthesia induction during LMA insertion in outpatient urological surgeries in terms of time for LMA insertion, frequency of apnea, frequency of complications related to the procedure and changes in the mean arterial pressure (MAP). Our findings will contribute in optimizing the anesthesia protocols, improving patient safety, and enhancing the overall outcomes of the outpatient urological surgeries.

METHODS

This randomized controlled trial was conducted at the Department of Anesthesia, Fauji Foundation Hospital, Rawalpindi from January 2022 to June 2022, over a period of 6 moths.

The approval of conducting the study was obtained from the ethical committee (Dated: 11/09/2019) of the hospital. Sample size calculation was done based on following assumptions using WHO calculator:
p1 (MAP after 5 minutes of induction in the propofol group) $=75.33 \pm 8.41$mmHg.
p2 (MAP after 5 minutes of induction in the Sevoflurane group) $= 81.47 \pm 6.29$mmHg.[11]
alpha $= 5\%$ (two-sided), power $= 85\%$.
The estimated sample size: $n1 = 29$, $n2 = 29$.

A total of 60 patients aging $\geq$ 18 years, having ASA (American Society of Anesthesiologists) status I or II and undergoing planned urological procedures were enrolled using consecutive sampling and randomized into 2 equal groups, Group P (Propofol group) and Group S (Sevoflurane group), comprising of 30 patients each using computer generated randomization.

The exclusion criteria were set as patients belonging to ASA class III or IV, patients with a predicted difficult airway (such as a thyromental distance of less than 6 cm or restricted neck extension) and pregnant women. Additionally, individuals with a known allergy to volatile anesthetics or propofol, patients with impaired communication abilities (disorientation, impaired hearing, or language barrier) and patients with pharyngeal pathology were also excluded.

A written consent was obtained from each participant prior to enrolment in the study.

Baseline assessments were completed one day prior to surgery. Baseline vitals were recorded, and standard monitoring (ECG, SpO_2, non-invasive blood pressure) was initiated upon the admission to the operation theater (OT). All patients received 5 ml/kg intravenous crystalloid fluid before induction. Intravenous fentanyl (1 μg/kg) and midazolam (0.03 mg/kg) were administrated followed by pre-oxygenation with 100% oxygen. No additional premedication was administered prior to OT arrival.

In Group P, induction was done using intravenous propofol 2 mg/kg administered over 30 seconds. Additional 0.5 mg/kg doses were administered if needed until the eyelash reflex disappeared and sufficient jaw relaxation was attained. In Group S induction was performed using Sevoflurane (8%) in 100% oxygen via a facemask, titrated to loss of eyelash reflex. Patients were asked to exhale to residual volume, then inhale maximally from the anesthetic circuit and hold their breath up to comfort level and then breathe normally. After achieving adequate conditions, LMA Classic™ was inserted as per recommended technique.

The time from induction initiation to successful LMA insertion was recorded. Incidences of apnea, coughing, gagging, or involuntary movements during the process of insertion were observed and documented. Anesthesia was then maintained with 2–3% Sevoflurane in both groups. MAP was assessed at baseline and subsequently at 2, 4, and 6-minutes post-induction.

Primary outcomes of the study included the time for successful insertion of LMA, (defined as the duration from induction start to successful placement), frequency of apnea (identified by the absence of visible chest movements for over 30 seconds) and complications related to LMA insertion (such as coughing, gagging, or patient movement), and the MAP at 2, 4, and 6-minutes post-induction.

Data analysis was performed using SPSS version 26.0. Mean± standard deviation was used to express continuous variables (such as age, weight, time for LMA insertion and MAP) while categorical variables (like gender, smoking history, ASA status, Apnea and Complications of LMA insertion) were presented as frequency and percentage. Numerical data between the groups was compared using the independent t-test and categorical data were analyzed with the chi-square test. Statistical significance was established at $p \leq 0.05$.

RESULTS

The mean age of study participants was 41.43±8.24 years, with age ranging from 25 to 54 years. The study population comprised 34 (56.66%) males and 26 (43.33%) female patients. The details of demographics and clinical status are shown in Table-I.

Demographics and Clinical Status		Group P (n=30)	Group S (n=30)
Age (Mean±SD) years		40.83±8.79	42.03±7.77
Gender	Male n (%)	16 (53.33)	18 (60)
	Female n (%)	14 (46.7)	12 (40)
BMI (Mean±SD) Kg/m^2		27.87±2.39	28.33±2.06
Smoking history n (%)		6 (20)	5 (16.6)
ASA score	I n (%)	17 (56.66)	18 (60)
	II n (%)	13 (43.33)	12 (40)

Table-I. Demographics and clinical status n= 60

The results of study outcomes show that LMA insertion time was higher in Group S when compared to the Group P ($p < 0.0001$). Moreover, Group P exhibited a significantly higher frequency of apnea episodes ($p=0.03$) and complications associated with LMA placement ($p=0.02$) compared to Group S. No statistically significant difference was recorded regarding the MAP at 0, 2 and 4 minutes, however, significant lower MAP was observed at 6 minutes after induction in Group P compared to Group S ($p=0.01$), as shown in Table-II.

DISCUSSION

The mean age in our study was 41.43±8.24 years. The study population comprised 34 (56.66%) males and 26 (43.33%) female patients. The results of primary outcomes show that LMA insertion time was significantly higher in Group S compared to the Group P ($p < 0.0001$).

Study Outcomes		Group P (n=30)	Group S (n=30)	chi-square/ t-value	P-Value
LMA insertion time (Mean±SD) Sec.		108.3±9.38	124±13.97	5.11	<0.0001
Post induction MAP	At base line (Mean±SD) mm HG	89.97±3.68	90.57±3.43	0.65	0.52
	At 2 Min. (Mean±SD) mm HG	87.83±3.83	88.07±2.98	0.27	0.79
	At 4 Min. (Mean±SD) mm HG	87.6±3.68	87.57±2.56	0.04	0.97
	At 6 Min. (Mean±SD) mm HG	86.53±2.79	87.3±2.56	2.95	0.01
Incidence of apnea n (%)		14 (46.66)	6 (20)	4.8	0.03
Complications related to LMA insertion n (%)		17 (56.66)	8 (26.67)	5.55	0.02

Table-II. Comparison of LMA insertion time, MAP, incidence of apnea and complications n=60

On the other hand, Group P exhibited a significantly higher frequency of apnea episodes (p=0.03) and complications associated with LMA placement (p=0.02) compared to Group S. No statistically significant difference was recorded regarding the MAP at 0, 2 and 4 minutes, however, significantly lower MAP was observed at 6 minutes after induction in Group P in comparison to Group S (p=0.01).

The effectiveness of sevoflurane and propofol for anesthesia induction during LMA insertion has been a research topic during last few years, due their important role in a successful outpatient surgery, with varying outcomes.

Banerjea A et al. compared sevoflurane and propofol for LMA insertion in surgical procedures similar to our study. Results demonstrated that while propofol enabled faster LMA insertion, it was associated with significantly higher rates of apnea and insertion complications. Sevoflurane was able to maintain better hemodynamic stability with a maintenance of MAP in the post-induction phase. Despite requiring slightly longer insertion time, superior safety profile and fewer complications made sevoflurane a potentially preferable choice for anesthesia induction in this clinical setting.[12] Dash LN et al. compared Sevoflurane and Propofol for LMA insertion and reported that Sevoflurane required longer time for jaw relaxation (p=0.0001) and LMA insertion (p=0.0001). However, Sevoflurane maintained better hemodynamics (p=0.02) with comparable safety and fewer hypotensive episodes. Hence despite delays, Sevoflurane's stable CV profile and reliability supports its use as an alternative to Propofol for LMA insertion.[13] Mathur V et al. studied the topic and reported that Propofol enabled significantly faster induction and LMA insertion (p<0.05) compared to sevoflurane. It was noted that Sevoflurane offered better hemodynamic stability as Propofol caused a significant drop in MAP (p<0.05), with comparable pulse rates.[11] The results of comparison between Sevoflurane and Propofol for LMA insertion reported by Reddy JS et al. mentioned that Propofol ensured excellent insertion conditions in all patients, while sevoflurane ranged from excellent to satisfactory as Sevoflurane showed higher, but statistically non-significant airway-related incidents. Hence, Sevoflurane provided better hemodynamic stability, but propofol ensured superior anesthesia quality and faster LMA insertion.[14] A prospective study by Rao KL compared propofol and sevoflurane for LMA insertion in 100 surgical patients, where Propofol demonstrated superior performance in achieving loss of eyelash reflex and verbal contact compared to Sevoflurane. The changes in MAP were, however, more stable with Sevoflurane.[15] Ravi S et al. shared that propofol (3 mg/kg) ensured faster jaw relaxation and LMA insertion compared to sevoflurane (7%) in pediatric patients. Both groups had comparable first-attempt success rates and hemodynamic stability, thereby Propofol and sevoflurane were found equally effective for LMA insertion in children, with varying procedural advantages with each one of them.[16]

A different recommendation was shared by Kiran I et al. where LMA insertion was smoother with Propofol, providing 'excellent' quality in all patients, while Sevoflurane showed 'excellent to

satisfactory' conditions. Airway-related incidents and patient movements were higher with sevoflurane, requiring more insertion attempts (statistically significant). Sevoflurane provided better hemodynamic stability ($p<0.01$), but jaw relaxation was delayed, prolonging LMA insertion time compared to propofol ($p<0.01$).[17] Singh H et al. were also consistent with Kiran I et al. and reported that Propofol enabled faster ($p<0.001$) and smoother LMA insertion with better suppression of airway reflexes while Sevoflurane, required longer induction. As a conclusion, Propofol remained superior for rapid, optimal LMA insertions, while sevoflurane served as an alternative with better hemodynamic stability.[18]

Our findings provide important input for anesthesiologists managing outpatient urological procedures and suggest that sevoflurane may be preferable when hemodynamic stability and minimal airway complications are prioritized over rapid insertion. This advantage is particularly relevant for elderly patients or those with CV comorbidities where maintaining stable blood pressure is among the most important considerations while performing outpatient surgical procedures.

The limitations of our research include its small sample size and single-center design which may limit generalizability of results.

CONCLUSION

Propofol enables faster LMA insertion, while sevoflurane is associated with significantly fewer complications, reduced incidence of apnea, and better hemodynamic stability. This favorable safety profile makes sevoflurane a preferable choice, despite requiring longer insertion time, for anesthesia induction during LMA insertion in outpatient urological procedures.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Young S, Osman B, Shapiro FE. **Safety considerations with the current ambulatory trends: More complicated procedures and more complicated patients.** Korean J Anesthesiol. 2023; 76(5):400-12. doi: 10.4097/kja.23078.

2. Haihan D, Changfei Z, Hengli L, Ning T, Lezhen Z, Hui L. **The development of day surgery in China and the effectiveness and reflection of day surgery in ophthalmology-specialized hospitals.** Cost Eff Resour Alloc. 2024; 22(1):47. doi: 10.1186/s12962-024-00558-9.

3. Manzoor H, Leslie SW, Saikali SW. **Extracorporeal shockwave lithotripsy.** [Updated 2024 Oct 18]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK560887/.

4. Pietropaolo A, Hendry J, Kyriakides R, Geraghty R, Jones P, Aboumarzouk O, et al **Outcomes of elective ureteroscopy for ureteric stones in patients with prior urosepsis and emergency drainage: Prospective study over 5 year from a Tertiary Endourology Centre.** Eur Urol Focus. 2020; 6(1):151-56. doi: 10.1016/j.euf.2018.09.001.

5. Smith G, D'Cruz JR, Rondeau B, Goldman J. **General anesthesia for surgeons.** [Updated 2023 Aug 5]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK493199/.

6. Folino TB, Muco E, Safadi AO, Parks LJ. **Propofol.** [Updated 2023 Jul 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430884/.

7. Obsa MS, Sholla AL, Baraki BG, Welde GD, Gelgelu TB, Kuruche MM. **Effect of laryngeal mask airway insertion versus endotracheal intubation on hemodynamic responses in pediatric patients undergoing ophthalmic surgery at Menelik II Hospital, Addis Ababa: A prospective observational study.** Anesthesiol Res Pract. 2020 Jun 1; 2020:7021641. doi:10.1155/2020/7021641. PMID: 32565787; PMCID: PMC7285405.

8. Jabaudon M, Zhai R, Blondonnet R, Bonda WLM. **Inhaled sedation in the intensive care unit.** Anaesth Crit Care Pain Med. 2022; 41(5):101133. doi: 10.1016/j.accpm.2022.101133.

9. Miller AL, Theodore D, Widrich J. **Inhalational Anesthetic.** [Updated 2023 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554540/.

10. Ruszkai Z, Szabó Z. **Maintaining spontaneous ventilation during surgery—a review article.** J Emerg Crit Care Med. 2020; 4:5. doi: 10.21037/jeccm.2019.09.

11. Mathur V, Garg D, Jain N, Singhal V, Khare A, Sethi SK. **A comparative study of propofol and N2O versus sevoflurane and N2O with respect to haemodynamic response and ease of laryngeal mask airway insertion: A prospective randomized double blinded study.** Int J Res Med Sci. 2016; 4(8):3421-6. DOI: https://doi.org/10.18203/2320-6012.ijrms20162305.

12. Banerjea A, Ghosh S, Singh UR, Mukhopadhyay O. **A comparison between propofol and sevoflurane for easy insertion of laryngeal mask airway among adults in minor elective surgeries: An observational study.** Natl J Physiol Pharm Pharmacol. 2023; 13(03):629-34. DOI: 10.5455/njppp.2023.13.11548202202022023.

13. Dash LN, Panda J, Nayak MK, Biswal D, Dalai H. **A Comparative study of sevoflurane and propofol for laryngeal mask airway insertion in adults.** J Cardiovac Dis Res. 2023; 14(11):131-9.

14. Reddy JS. **Comparison of Sevoflurane and Propofol for Laryngeal Mask Airway Insertion in Adults.** Acad. Anesthesiol. Int. 2019; 4(1):137-42. doi.org/10.21276/aan.2019.4.1.27.

15. Rao KL, Kumar SA, Mahendra BV, Kumar CVVS. **A prospective study to compare sevoflurane and propofol for laryngeal mask airway insertion.** Int J Pharm Clin Res. 2024; 16(2):653-5.

16. Ravi S, Krishnamoorthy K, Ganesan I. **Comparison of sevoflurane and propofol for laryngeal mask airway insertion in children.** Indian J Clin Anaesth. 2015; 2(3):137-40. doi:10.5958/2394-4994.2015.00015.3.

17. Kiran I, Sundar KSD, Vardhini KS. **Comparison of sevoflurane induction versus propofol induction for insertion of laryngeal mask airway in adults.** Int J Acad Med Pharm. 2023; 5(1):466-72. doi:10.47009/jamp.2023.5.1.97.

18. Singh H, Dhawan G, Brar PKS, Bhardwaj S, Barman M, Srivastava R. **Comparative study of sevoflurane versus propofol for laryngeal mask airway insertion in adults.** Int J Health Sci. 2022; 6(S2):9441-6. https://doi.org/10.53730/ijhs.v6nS2.7473.

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Saima Zia:** Conception of study, designing, planning, Experimentation, study conduction, analysis, interpretation, discussion, manuscript writing.
2	**Brig Manzoor Ahmed Faridi:** Conception of study, designing, planning, critical review, facilitated for reagents, material analysis.
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