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RESEARCH ARTICLE

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Use of view-adjustable video laryngeal mask versus endotracheal intubation for airway management during anaesthesia for arthroscopic surgery: a randomized trial

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ABSTRACT

Introduction: The objective of this study was to compare the practicality and efficacy of utilizing a view-adjustable video laryngeal mask (SafeLM) versus endotracheal intubation (ETI) in the context of arthroscopic shoulder surgery.

Patients and Methods: A randomized controlled trial enrolled 100 patients undergoing arthroscopic shoulder surgery, randomly assigned to the SafeLM group (n = 50) or ETI group (n = 50). The primary outcome measure was hemodynamic parameters, while mechanical ventilation parameters, complications, and the quality of anaesthesia recovery were considered as secondary outcomes. These parameters were then compared between the two groups.

Results: During the intubation and extubation procedures, the SafeLM group demonstrated significantly lower mean arterial pressure and heart rate compared to the ETI group ($p<0.001$). Furthermore, the airway pressure at T_2 and T_3 was notably lower in the SafeLM group compared to the ETI group ($p<0.001$). However, there were no statistically significant differences in oxygen saturation observed between the two groups at any time point. Both groups were equally capable of quickly establishing a surgical airway when necessary. Notably, a smaller proportion of patients in the SafeLM group exhibited negative reactions during tube removal. Additionally, there was a statistically significant difference in the occurrence of post-operative sore throat, difficulty swallowing, choking, and coughing between the two groups ($p<0.001$).

Conclusions: The utilization of SafeLM may result in enhanced regulation of blood pressure and heart rate among patients who undergo arthroscopic surgery for the shoulder while in the side decubitus position.

HIGHLIGHTS

1. Compared with endotracheal intubation (ETI) group, view-adjustable video laryngeal mask (SafeLM) group had smaller changes in mean arterial pressure (MAP) and heart rate (HR) during the intubation and extubation phase ($p<0.001$).
2. In supine and lateral decubitus position, the airway pressure (AP) in the SafeLM group is significantly lower than in the ETI group ($p<0.001$).
3. There were no statistically significant differences in oxygen saturation (SPO_2) observed between the two groups at any time point during the surgical procedure ($p>0.050$).
4. During the extubation phase, cough choking was significantly lower in the SafeLM group than in the ETI group ($p<0.001$).
5. Compared with endotracheal intubation (ETI) group, the occurrence of post-operative sore throat, difficulty swallowing, choking, and coughing in the SafeLM group are significantly lower than in the ETI group ($p<0.001$).
6. Compared with endotracheal intubation (ETI) group, patients in the SafeLM group being more satisfied ($p<0.001$).

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Introduction

Arthroscopic shoulder surgery is a minimally invasive procedure that's become a standard approach for diagnosing and treating various shoulder joint issues. Compared with open surgery, shoulder arthroscopy has obvious advantages such as less trauma, high accuracy, strong pertinence, quick postoperative recovery, and short hospital stay [1]. Endotracheal intubation (ETT) is the gold standard for airway management. However, the intubation and extubation process can irritate the throat and vocal cords, causing fluctuations in blood pressure and heart rate [2]. Patients with heart conditions are more susceptible to these circulatory changes during surgery. Any event that destabilizes the cardiovascular system can have severe consequences. Therefore, anaesthesiologists should reduce these risks, especially during the induction and extubation phases.

In clinical practice, various techniques are utilized to alleviate or manage cardiovascular stress and airway responses during intubation and extubation procedures. These methods encompass the administration of vasoactive drugs, such as esmolol or labetalol, the utilization of topical anaesthesia on the throat and trachea, blockade of the superior laryngeal nerve, augmentation of anaesthetic dosages, deepening the anaesthesia level, or the selection of appropriate airway management devices, such as the laryngeal mask airway (LMA) [3].

LMA has established itself as an invaluable tool in the realm of anaesthesia management, demonstrating safety and effectiveness in ensuring both spontaneous and controlled ventilation across a variety of surgical disciplines, including endoscopic, orthopaedic, thyroid, and neurosurgery, as well as in procedures extending beyond two hours in duration. This broad application underscores the versatility and reliability of the LMA in diverse surgical settings [4–6]. The view-adjustable video laryngeal mask (SafeLM) disposable laryngeal mask represents a significant innovation in the field of anaesthesia management by integrating tracheal intubation, oesophageal drainage, adjustable viewing angles, and continuous visibility into a single device. This latest domestically produced visual laryngeal mask, with its unique design, offers doctors a more convenient and safer airway management solution during various surgeries.

Currently, there is no published literature on the use of the SafeLM for arthroscopic shoulder surgery in the lateral position. Therefore, the aim of this clinical trial was to comparatively investigate the feasibility and efficacy of SafeLM use with endotracheal intubation (ETI) during arthroscopic shoulder surgery in the lateral decubitus position.

Patients and methods

Study participants

The inclusion criteria were as follows: 1) American Society of Anaesthesiology (ASA) physical status I–II; 2) 18–65 years of age; 3) Mallampati I to II patients with normal cognitive status; 4) active cooperation; 5) general anaesthesia; and 6) scheduled for arthroscopic shoulder surgery in lateral position between May 2023 and September 2023. Exclusion criteria: patients with cardiac dysfunction, moderate to severe ventilation dysfunction, reflux, aspiration risk factors and other conjunctive laryngeal mask use, patients with a history of difficult airway, restricted mouth opening, and limited neck movement. The patients were randomized to the SafeLM or ETI groups based on a random number table generated by a computer. The flow diagram of the study selection process was shown in Figure 1.

Study design and anaesthetic management

This was a randomized, single-blind, controlled trial. Patients receiving arthroscopic shoulder surgery in lateral decubitus position by the same surgeons were enrolled blindly. Two seniors anaesthetists and one experienced resident performed all anaesthesia operations. Postoperative data were collected by blinded researchers.

Patients fasted 8 h and abstained from drinking 4 h before surgery. Venous access was established 30 min prior. All patients were treated with general anaesthesia combined with interscalene brachial plexus block, which can provide good intraoperative and postoperative analgesia, intraoperative blood pressure control, and reduce stress response. Brachial plexus nerve block was performed using an ultrasound-guided intramuscular groove approach with 20 ml of 0.25% ropivacaine. Electrocardiography (ECG), oxygen saturation (SPO_2), mean arterial pressure (MAP), heart rate (HR), and bispectral index (BIS) were monitored.

Anaesthesia was induced with intravenous infusion of sufentanil, etomidate, and propofol. After unconsciousness and BIS (BISx®, Aspect Medical Systems, Inc., Norwood, MA, USA) ≤60, cisatracurium was intravenously administered for tracheal intubation or SafeLM insertion. SafeLM or ETI was inserted by the anaesthesiologist. Mechanical ventilation parameters were set to maintain $PetCO_2$ at 35–40 mmHg. Propofol and remifentanil were injected intravenously during

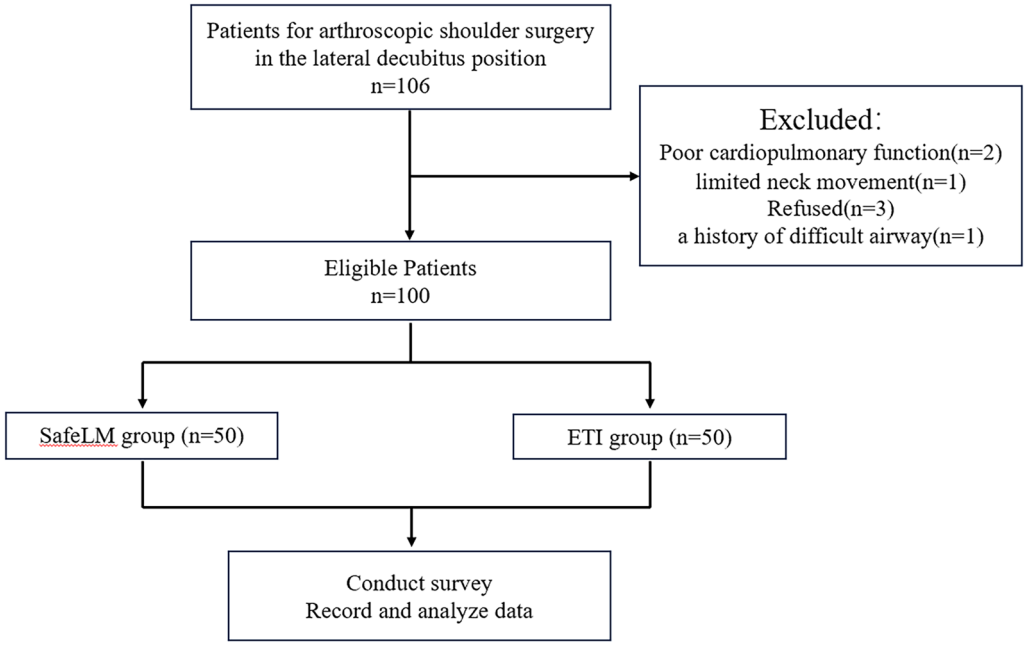

Figure 1. Flow diagram of the study selection process. SafeLM, view-adjustable video laryngeal mask; ETI, endotracheal intubation.

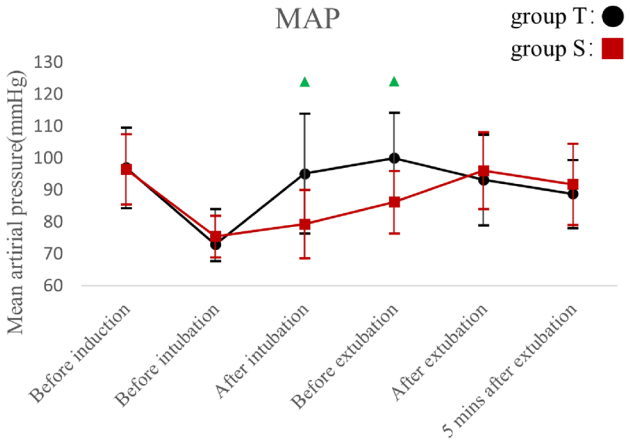

Figure 2. MAP at different time points in the SafeLM and ETI groups. ▲ $p < 0.001$ versus the ETI group. MAP, mean arterial pressure; SafeLM, view-adjustable video laryngeal mask; ETI, endotracheal intubation.

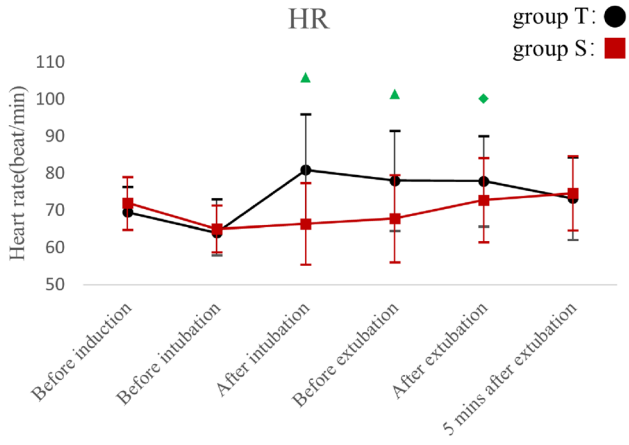

Figure 3. HR at different time points in the SafeLM and ETI groups. ▲ $p < 0.050$ and ▲ $p < 0.001$ versus the ETI group, respectively. HR, heart rate; SafeLM, view-adjustable video laryngeal mask; ETI, endotracheal intubation.

surgery, dosage adjusted to maintain BIS 40–60. If intraoperative HR ≤50 beats/min, atropine was injected intravenously. If MAP reduction exceeded 20% of baseline, phenylephrine hydrochloride was intravenously administered. Lactated Ringer's solution and hydroxyethyl starch 130/0.4 were intravenously infused to replace fluid and blood losses.

The score for glottic counterpoint in the SafeLM group was recorded in both supine and lateral positions, in accordance with the endoscopic view grading system (EVGS), which aligns with the Cormack and Lehane grading system for laryngoscopic view. Specifically, grade 1 represented a complete view of the glottis aperture, assigned a score of 4 points; grade 2 denoted a partial view of the glottis aperture, awarded 3 points; grade 3 corresponded to a view of the free edge or ventral face of the epiglottis, assigned 2 points; and grade 4 indicated an unrecognizable structure or whiteout screen, awarded 1 point [7].

The spontaneous breathing pattern of patients was used to measure oropharyngeal leakage pressure (OLP) in the SafeLM group. In manual ventilation mode, the APL valve was set to 40 cmH_2O and oxygen flow to 6 L/min. OLP was recorded when leakage

sound occurred. If OLP exceeded 40 cmH_2O without leakage, measurement stopped, and airway sealed pressure was noted as 40 cmH_2O [8]. After pressure measurement, intermittent positive-pressure ventilation was initiated with anaesthesia machine. SafeLM cuff was inflated with recommended air volumes (20, 30, 40 mL for sizes 3, 4, 5), and tracheal balloon inflated to 25–30 cmH_2O (measured by balloon manometer). Airway pressure (AP) was recorded again in both groups while in the lateral position.

Airway devices were removed from the operating room when consciousness, airway reflexes, muscle tension, and spontaneous respiration returned to normal ($PetCO_2$ 7 mL/kg). Patients were then transferred to the PACU for observation. No analgesics or tranquilizers were administered during recovery.

Measurements

Clinical variables included hemodynamic parameters (MAP as primary outcome, HR as secondary), ventilation parameters, insertion parameters, surgical parameters, and postoperative reactions. Hemodynamic parameters were monitored continuously using an anaesthesia monitor (Bene View T8). Parameters were recorded at multiple time points: before anaesthesia induction (T0), before intubation (T1), after intubation (T2), spontaneous breathing recovery (T3), after extubation (T4), and 10 min later (T5). Vasoactive drug use was recorded, with intravenous infusions used to treat hypertension or tachycardia.

Ventilation parameters, including minute ventilation and AP, were recorded after intubation and lateral positioning. Insertion parameters encompassed success rates (first, adjusted first, and second), OLP and glottic counterpoint scores in supine and lateral position for the SafeLM group. Anaesthesia recovery quality was assessed by extubation time, coughing grade during extubation, post-surgical sore throat cases, and visual analog scale (VAS) scores 2 h post-surgery. Postoperative reactions were evaluated based on nausea/vomiting cases, intraoperative awareness, hypoxia, and pulmonary atelectasis.

Statistical analysis

The group sample size was calculated as 42 per group (42 in the SafeLM group and 42 in the ETI group because it would provide 80% power to reject the null hypothesis of equal means when the mean difference is −8 (83–91) with standard deviations of 13 for SafeLM group and 13 for the ETI group at a two-sided alpha of 0.05. With an anticipated dropout rate of 15%, the total sample size required was 100 (50 in the SafeLM group; 50 in the ETI group).

Statistical analysis was conducted using SPSS 21.0. Measurement data with normal distribution were represented by mean ± standard deviation and analyzed by ANOVA (surgical, insertion, and postoperative recovery times). Discrete data were analyzed using $\chi 2$ test or Fisher's exact probability test (sex, success rates, and complications). A significant *p*-value was set at <0.050.

Results

Demographic and anaesthesia data

One hundred patients were randomized into the SafeLM or ETI group ($n = 50$ per group). Patients in both groups were successfully intubated once. Table 1 presents the demographic data, including sex, age, and body mass index (BMI), as well as surgical details. There was no statistically significant difference in the basic data between the two groups.

Intraoperative fluctuations of MAP and HR

MAP and HR were significantly different between the two groups at T_2 and T_4 (all $p < 0.001$). HR was also significantly different between the two groups at T_5 ($p < 0.050$). At the remaining time points observed, MAP and HR were not statistically different between the groups (Figures 2 and 3). Three patients received esmolol and four received nicardipine during anaesthesia induction in ETI group. One patient received nicardipine during anaesthesia induction in SafeLM group. One patient received esmolol and one received nicardipine during anaesthesia recovery in ETI group. (Table 1).

Insertion related parameters

There was a significant difference between the two groups in the time from the start of general anaesthesia induction to the successful establishment of the airway($p < 0.001$). It is used for a shorter time in the SafeLM group(Table 1). The success rate of the first insertion between the two groups was not statistically significant, with both groups achieving a rate of 100%. Furthermore, in the SafeLM group, there was no difference in the glottic counterpoint score and OLP between the supine and lateral positions (Table 2).

Intraoperative ventilation parameters

At T_2 and T_3, there was a statistically significant difference in AP between the two groups ($p < 0.050$). Specifically, when compared to the ETI group, the AP levels in the SafeLM group were marginally lower. SPO_2 levels in both groups remained consistent and did not exhibit any noteworthy variations between the groups at any given time point ($p > 0.050$). The detailed numerical data are presented in Table 3.

Table 1. Demographic data and surgery details in the SafeLM and ETI groups.

	SafeLM group ($n = 50$)	ETI group ($n = 50$)	$T/\chi^2/F$	p-value
Age (years)	50.9 ± 9.9	49.7 ± 9.4	−0.621	0.536
Sex (M/F)	24/26	23/27	0.040	0.841
BMI (kg/m^2)	24.7 ± 3.5	25.1 ± 3.3	0.662	0.509
ASA grade				
I ~ II	50 (100.0%)	49 (98.0%)	0.364	1.233
III	0 (0.0)	1 (2.0%)	--	--
Medical History				
Hypertension	8 (16.0%)	9 (18.0%)	0.878	0.568
Diabetes	6 (12.0%)	4 (8.0%)	0.996	0.449
Ventricular premature beats	0 (0.0)	1 (2.0%)	--	--
Application of vasoactive drug (cases) (esmolol/nicardipine)	0/1	4/5	/	/
Airway establishment time	3 (3, 4)	3 (2, 3)	/	0.000
Duration of anesthesia (minutes)	110.8 ± 23.8	103.3 ± 23.4	−1.585	0.116
Duration of operation (minutes)	67.5 ± 22.5	67.3 ± 22.0	−0.045	0.964

SafeLM: View-adjustable video laryngeal mask; ETI: endotracheal intubation; BMI: body mass index.

Table 2. Comparison of position change of view-adjustable laryngeal mask in SafeLM group.

	Glottic counterpoint score (median (Q1, Q3))	OLP (median (Q1, Q3), (cmH_2O))
Supine position	4 (3.75, 4)	30 (26.75, 34)
Lateral position	4 (3, 4)	28 (25, 32.25)
P-value	0.865	0.064

SafeLM, view-adjustable video laryngeal mask; OLP, oropharyngeal leakage pressure.

Anaesthesia and postoperative recovery

Compared with the SafeLM group, the ETI group had a higher probability of coughing during extubating ($p < 0.001$). The number of patients with sore throat when swallowing ($n = 32$) was significantly higher in the ETI group ($p < 0.001$) than in the SafeLM group ($n = 14$). After a surgical procedure, it was observed that the VAS score for throat discomfort upon swallowing was notably elevated in the ETI group compared to the SafeLM group, reaching statistical significance at the 2-hour mark ($p < 0.001$). Additionally, during the removal of the tracheal catheter, bloody discharge was noted around the capsule in four patients belonging to the ETI group and in one patient from the SafeLM group. The incidences of other adverse reactions, such as nausea and vomiting, intraoperative awareness, dysphagia, and hypoxaemia, were no significant difference between the two groups. There was also a difference in patient satisfaction between the two groups, with patients in the SafeLM group being more satisfied ($p < 0.001$; Table 4).

Discussion

Our findings suggest that there were statistically significant differences in MAP and HR between patients in SafeLM group at critical moments of intubation and extubation compared with those in ETI group ($p < 0.001$). This means that SafeLM has less of an impact on the patient's circulation than ETI. The process of intubation and extubation is prone to irritation of the pharynx and voice valves, leading to fluctuations in blood pressure and HR [9]. The LMA serves as a compensation for the constraints related to tracheal intubation. Its design, tailored to the anatomy of the human pharynx, ensures that the glottis remains shielded, minimizing irritation during both insertion and removal. Its widespread utilization in surgical procedures is attributed to its user-friendly operation, robust reliability, and minimal irritation to the pharynx [10–12]. Numerous studies have consistently affirmed the safety and efficacy of LMA usage [4,6]. Some

Table 3. Comparison of the ventilation parameters between the SafeLM and ETI groups.

	AP (median (Q_1, Q_3), (cmH_2O))		SpO_2(median (Q1, Q3), %)					
	Supine position	Lateral position	T_0	T_1	T_2	T_3	T_4	T_5
ETI group ($n = 50$)	15 (14, 17)	17 (16, 19)	98 (97, 99)	100 (99, 100)	100 (99, 100)	100 (99, 100)	100 (99, 100)	97 (96, 100)
SafeLM group ($n = 50$)	14 (12, 15.25)	15 (14, 17)	98 (96, 99)	100 (99, 100)	100 (99, 100)	100 (99, 100)	99 (98, 100)	98 (96, 99.25)
P-value	<0.001	<0.001	0.553	0.158	0.791	0.472	0.061	0.609

SafeLM, view-adjustable video laryngeal mask; ETI, endotracheal intubation; AP, air pressure; T_0: before anaesthesia induction; T_1: before intubation; T_2: after intubation; T_3: spontaneous breathing recovery; T_4: after extubating; T_5: 10 min after extubating.

Table 4. Comparison of the quality of anaesthesia and postoperative recovery between the SafeLM and ETI groups.

	Coughing grade during resuscitation				Number of cases of sore throat 2 h after surgery(cases)	Pain score for pharyngeal swallowing 2 h after surgery (mean (Q1, Q3))	Dysphagia (cases)	Bloody globular discharge (cases)	Hoarse (cases)	Nausea and vomiting (cases)	Patient satisfaction score (mean (Q1, Q3))
	I	II	III	IV							
ETI group ($n=50$)	5	13	28	4	32	1.5(0,3)	0	4	0	0	9(8,10)
SafeLM group ($n=50$)	46	4	0	0	14	0(0,1.25)	0	1	0	0	10(9,10)
χ^2	/				13.04	/	/	/	/	/	/
P-value	<0.001				<0.001	0.001	<0.001	0.362	<0.001	<0.001	<0.001

SafeLM, view-adjustable video laryngeal mask; ETI, endotracheal intubation.

studies have shown that the use of laryngeal masks had a lower effect on postoperative complications in elderly patients than the use of tracheal catheters [13,14]. The results of these studies on LMA are consistent with the results of our studies on SafeLM.

Hemodynamic fluctuations generated by the use of different ventilation tools might be clinically significant in patients who have concomitant cardiovascular or cerebrovascular diseases [2]. However, this study did not involve such populations, and further exploration of the application value for these patients and critically ill patients requires additional randomized controlled trials (RCTs). Nevertheless, this study suggests that for patients with ASA grades I to II, the use of vasopressor drugs was relatively lower in the SafeLMA group compared to the ETI group. This might indicate a greater advantage in using the SafeLM for such patients.

Main factors affecting respiratory parameters during surgery are age, respiratory diseases, surgical method, surgical position, and ventilation method [15–19]. To minimize confounding factors, we used data from patients aged 18–65 with surgical duration <4h, no respiratory complications, and no excessive twisting of the head or neck. In our study, the first intubation attempt was successful in both groups due to experienced anaesthesiologists performing the procedures.

An oropharyngeal leak pressure (OLP) of ≥20 cmH_2O related to the use of Laryngeal Mask Airway (LMA) is considered safe and effective for mechanical ventilation in most patients [20]. In our study, the average OLP of the SafeLM group exceeded 20 cmH_2O, indicating its reliability. The stability of the LMA's position is crucial for safe ventilation, as changes in the surgical position can easily alter the LMA's placement. However, some studies have shown that ventilation through the laryngeal mask remains safe even when switching from a supine to a lateral position [21,22]. In our research, there was no difference in the glottic alignment scores and OLP between the supine and lateral positions within the SafeLM group. Moreover, at the same body position, the airway pressure (AP) in the SafeLM group at time T_3 was significantly lower than in the Endotracheal Intubation (ETI) group, showcasing a clear clinical application advantage. Notably, the SafeLM group experienced no incidents of transient leakage throughout the surgery.

The SafeLM group had lower cough incidence and VAS score for postoperative sore throat compared to the ETI group. Sore throat is a significant adverse reaction after general anaesthesia, affecting recovery, satisfaction, and medical disputes [23]. In this study, the SafeLM group had significantly lower sore throat incidence during swallowing compared to the ETI group, consistent with previous studies. The ETI group had a higher coughing probability during extubation and lower patient satisfaction scores.

The advent of the SafeLM, a Chinese-engineered device, marks a significant leap in medical technology, particularly in the realm of airway management. Unlike traditional LMAs, the SafeLM is visibility during the laryngeal mask placement process. The video guidance feature allows operators to accurately position the laryngeal mask, thereby minimizing potential damage and irritation to the epiglottis, larynx, and adjacent soft tissues. Additionally, the device's adjustable viewing angle broadens the scope of observation, reducing the likelihood of air leakage and airway obstruction by confirming proper mask positioning and averting blockages from the epiglottis and other tissues. Moreover, the SafeLM facilitates the early detection and management of secretions, thereby diminishing the risk of aspiration. Its adaptability proves advantageous in emergencies or instances of difficult intubation, allowing for an initial insertion of the laryngeal mask followed by visual-guided intubation without compromising patient oxygenation. The device's operational prowess is further augmented by automatic video storage and wireless connectivity to computers, streamlining the process for educational purposes. Overall, the SafeLM stands out as a more convenient,

safe, and reliable alternative to traditional LMAs, heralding a new era in airway management.

Despite the promising capabilities of the SafeLM, its application in surgeries conducted in the lateral decubitus position remains undocumented. To address this gap, an investigation into its efficacy and feasibility during arthroscopic shoulder surgery can provide valuable insights.

This study has the following limitations: first, this study only confirmed the application of SafeLM in low-risk adult patients, but the ventilation effect of shoulder arthroscopic surgery in patients with difficult airway still needs to be verified, and the results of this study cannot be extruded to children. Second, this study was only single-blind, and the anaesthesiologist responsible for laryngeal mask placement knew the laryngeal mask type, which might cause observer bias. Finally, SafeLM is intubated laryngeal mask, this study only compared its ventilation function, and its function of guiding tracheal intubation needs further study. In addition, before the study, we calculated the sample size to be 40 per group based on relevant research results. After the study started, we recalculated the sample size to 50 per group based on the collected data. Therefore, we are here to explain why the sample size in the manuscript is not exactly consistent with the sample size in the clinical registration.

Conclusion

In summary, the findings of this study indicate that SafeLM is capable of maintaining hemodynamic stability in ASA I~II patients undergoing shoulder arthroscopy in the lateral position. Therefore, from the perspectives of patient safety and comfort, SafeLM can serve as an alternative to tracheal intubation for this population.

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Study design: Hong Zeng, Chun-Jing Geng, Guang-Lei Su.

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Data analysis: Ying Deng, Zhukai Cong.

Data interpretation: Hong Zeng, Chun-Jing Geng, Guang-Lei Su.

Drafting of article: Chun-Jing Geng, Guang-Lei Su.

Review & editing: Hong Zeng.

All authors have read and approved the final work.

Ethical approval

This study was approved by the Institutional Review Board and Ethics Committee of Peking University Third Hospital (LM2022760). The study adheres to the Declaration of Helsinki. Written informed consent was obtained from all patients. The trial was registered at https://www.chictr.org.cn/ (ChiCTR2300071058).

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The data that support the results of this study is available from the authors upon reasonable request and with permission of Peking University Third Hospital.

References

[1] Hurley ET, Lim Fat D, Farrington SK, et al. Open versus arthroscopic latarjet procedure for anterior shoulder instability: a systematic review and meta-analysis. Am J Sports Med. 2019;47(5):1248–1253. doi: 10.1177/0363546518759540.

[2] Amrani G, Gefen A. Which endotracheal tube location minimises the device-related pressure ulcer risk: the centre or a corner of the mouth? Int Wound J. 2020;17(2):268–276. doi: 10.1111/iwj.13267.

[3] Bruder N, Ortega D, Granthil C. Consequences and prevention methods of hemodynamic changes during laryngoscopy and intratracheal intubation. Ann Fr Anesth Reanim. 1992;11(1):57–71. doi: 10.1016/s0750-7658(05)80321-1.

[4] Liao H, Chen L, Sheng C. The effects of on hemodynamics, oxygen saturation, peak airway pressure and adverse events during anesthesia for thyroid surgery: tracheal intubation Vs. ProSeal laryngeal mask airway. Am J Transl Res. 2021;13(4):2738–2744.

[5] Shah K. ProSeal laryngeal mask airway as an alternative to standard endotracheal tube in securing upper airway in the patients undergoing beating-heart coronary artery bypass grafting. Ann Card Anaesth. 2017;20(1):61–66. doi: 10.4103/0971-9784.197838.

[6] Zhang Q, Sun Y, Wang B, et al. Comparative study of the Ambu(R) AuraOnce laryngeal mask and endotracheal intubation in anesthesia airway management during neurosurgery. J Int Med Res. 2020;48(2):300060520902606. doi: 10.1177/0300060520902606.

[7] Dhonneur G, Ndoko SK, Yavchitz A, et al. Tracheal intubation of morbidly obese patients: LMA CTrach vs direct laryngoscopy. Br J Anaesth. 2006;97(5):742–745. doi: 10.1093/bja/ael219.

[8] Wong DT, Ooi A, Singh KP, et al. Comparison of oropharyngeal leak pressure between the Ambu(R) AuraGain

and the LMA(R) Supreme supraglottic airways: a randomized-controlled trial. Can J Anaesth. 2018;65(7):797–805. doi: 10.1007/s12630-018-1120-4.

[9] Qamarul Hoda M, Samad K, Ullah H. ProSeal versus classic laryngeal mask airway (LMA) for positive pressure ventilation in adults undergoing elective surgery. Cochrane Database Syst Rev. 2017;7(7):CD009026. doi: 10.1002/14651858.CD009026.pub2.

[10] Alshaer A. Comment on: Laryngeal mask airway for general anesthesia in interventional neuroradiology procedures. Saudi Med J. 2019;40(8):849–849. doi: 10.15537/smj.2019.8.24435.

[11] Zhu W, Wei X. A randomized comparison of pediatric-sized streamlined liner of pharyngeal airway and laryngeal mask airway-unique in paralyzed children. Paediatr Anaesth. 2016;26(5):557–563. doi: 10.1111/pan.12883.

[12] Cha SM, Park S, Kang H, et al. Gastric distension with SLIPA versus LMA ProSeal during laparoscopic cholecystectomy: a randomized trial. Surg Laparosc Endosc Percutan Tech. 2014;24(3):216–220. doi: 10.1097/SLE.0b013e3182905bb6.

[13] Yang LQ, Zhu L, Shi X, et al. Postoperative pulmonary complications in older patients undergoing elective surgery with a supraglottic airway device or tracheal intubation. Anaesthesia. 2023;78(8):953–962. doi: 10.1111/anae.16030.

[14] Chin KW, Smith AF. Choice of airway device and the incidence and severity of postoperative pulmonary complications in older patients. Anaesthesia. 2023;78(10):1191–1194. doi: 10.1111/anae.16077.

[15] Salihoglu T, Salihoglu Z, Zengin AK, et al. The impacts of super obesity versus morbid obesity on respiratory mechanics and simple hemodynamic parameters during bariatric surgery. Obes Surg. 2013;23(3):379–383. doi: 10.1007/s11695-012-0783-0.

[16] Klasen J, Junger A, Hartmann B, et al. Increased body mass index and peri-operative risk in patients undergoing non-cardiac surgery. Obes Surg. 2004;14(2):275–281. doi: 10.1381/096089204322857708.

[17] Nam Y, Yoon AM, Kim YH, et al. The effect on respiratory mechanics when using a Jackson surgical table in the prone position during spinal surgery. Korean J Anesthesiol. 2010;59(5):323–328. doi: 10.4097/kjae.2010.59.5.323.

[18] Choi SJ, Gwak MS, Ko JS, et al. The effects of the exaggerated lithotomy position for radical perineal prostatectomy on respiratory mechanics. Anaesthesia. 2006;61(5):439–443. doi: 10.1111/j.1365-2044.2006.04614.x.

[19] Suh MK, Seong KW, Jung SH, et al. The effect of pneumoperitoneum and Trendelenburg position on respiratory mechanics during pelviscopic surgery. Korean J Anesthesiol. 2010;59(5):329–334. doi: 10.4097/kjae.2010.59.5.329.

[20] Keller C, Brimacombe JR, Keller K, et al. Comparison of four methods for assessing airway sealing pressure with the laryngeal mask airway in adult patients. Br J Anaesth. 1999;82(2):286–287. doi: 10.1093/bja/82.2.286.

[21] Thakur DP, Malde AD. A study of effect of lateral position on oropharyngeal seal pressure of i-gel((R)) and ProSeal() LMA in children. Indian J Anaesth. 2020;64(2):125–130. doi: 10.4103/ija.IJA_635_19.

[22] Lim JA, Jeong MY, Kim JH. Airway management using laryngeal mask airway (LMA) in a patient in a lateral decubitus position: a case report. Medicine . 2019;98(51):e18287. doi: 10.1097/MD.0000000000018287.

[23] Venugopal A, Jacob RM, Koshy RC. A randomized control study comparing the pharyngolaryngeal morbidity of laryngeal mask airway versus endotracheal tube. Anesth Essays Res. 2016;10(2):189–194. doi: 10.4103/0259-1162.174466.