

## Original Research Article

**A RANDOMIZED CONTROLLED STUDY: COMPARING THE EFFECTIVENESS OF iSCOPE 3 AND AIRTRAQ VIDEO LARYNGOSCOPE EXAMINATIONS IN PATIENTS UNDERGOING TRACHEAL INTUBATION**Sania Parveen<sup>1a</sup> , Syed Moied Ahmed<sup>2</sup>, Mohd Najmul Aqib Khan<sup>3</sup> <sup>1</sup> Department of Anaesthesia, Geraldton Regional Hospital, WA, Australia<sup>2</sup> Department of Anaesthesiology & Critical Care, Jawaharlal Nehru Medical College, Aligarh, U.P, India<sup>3</sup> Hope Community Services, Geraldton, WA, Australia<sup>a</sup> Corresponding author: [sania.jc.9@gmail.com](mailto:sania.jc.9@gmail.com)**ABSTRACT**

**Introduction:** Nowadays, indirect laryngoscopy is a commonly used technique for teaching airway control skills. Incorporating small, less expensive, and yet more reliable video cameras into laryngoscopes has given the process of laryngoscopy and intubation, a big leap. The AirTraq has shown promise in several settings, while the iSCOPE 3 video laryngoscope is a newly launched device, and no literature is available to our understanding. **Objective:** To compare the effectiveness of the iSCOPE 3 video laryngoscope with the AirTraq optical laryngoscope. **Material and Method:** It was a randomized controlled study conducted among sixty patients after approval from the Board of Study and ethical clearance, divided into two groups. In Group AT, patients were intubated with AirTraq, and in Group IS, patients were intubated with iSCOPE 3 as per the protocol. The primary outcome metric was the duration of tracheal intubation. Secondary outcomes were measured by the quantity of tries and intubation ease, glottic view or percentage of the glottic opening score (POGO), and Cormack & Lehane grade. **Results:** In the iSCOPE 3 and AirTraq groups, comparable mean intubation times were observed. (19.50 s vs. 19.16 s). The ease of intubation was significantly better with iSCOPE 3 ( $p < 0.05$ ), single attempt was needed to intubate 96.7% of patients in the iSCOPE 3 group compared to 70% of patients in the AirTraq group ( $p < 0.05$ ). POGO score and Cormack & Lehane grade were also significantly better with iSCOPE 3 ( $p < 0.05$ ). **Conclusion:** Pogo and CL grade were better with iSCOPE 3 than AirTraq, and hence the success rate of intubation, number of attempts, and ease of intubation were significantly better with iSCOPE 3.

**Keywords:** AirTraq Video Laryngoscope; iSCOPE 3 Video Laryngoscope; Research; Tracheal intubation**ABSTRAK**

**Pendahuluan:** Saat ini, laringoskopi tidak langsung adalah teknik yang umum digunakan untuk mengajarkan keterampilan pengendalian jalan napas. Pemasangan kamera video kecil, lebih murah, dan lebih andal pada laringoskop telah memberikan lompatan besar dalam proses laringoskopi dan intubasi. AirTraq telah menunjukkan hasil yang menjanjikan dalam beberapa pengaturan, sementara iSCOPE 3 video laryngoscope adalah perangkat baru yang belum ada literatur yang tersedia sejauh pengetahuan kami. **Tujuan:** Membandingkan efektivitas iSCOPE 3 video laryngoscope dengan AirTraq optical laryngoscope. **Bahan dan Metode:** Penelitian ini merupakan studi acak terkontrol yang dilakukan pada enam puluh pasien setelah mendapatkan persetujuan dari Dewan Studi dan izin etik, yang dibagi menjadi 2 kelompok. Pada kelompok AT, pasien diintubasi dengan AirTraq, dan pada kelompok IS, pasien diintubasi dengan iSCOPE 3 sesuai dengan protokol. Parameter utama untuk hasil adalah durasi intubasi trakea. Hasil sekunder diukur dengan jumlah percobaan dan kemudahan intubasi, tampilan glotis atau persentase skor pembukaan glotis (POGO), dan derajat Cormack & Lehane. **Hasil:** Waktu intubasi rata-rata yang sebanding terlihat pada kelompok iSCOPE 3 dan AirTraq (19,50 detik vs. 19,16 detik). Kemudahan intubasi secara signifikan lebih baik dengan iSCOPE 3 ( $p < 0,05$ ), satu kali percobaan diperlukan untuk mengintubasi 96,7% pasien pada kelompok iSCOPE 3 dibandingkan dengan 70% pasien pada kelompok AirTraq ( $p < 0,05$ ). Skor POGO dan derajat Cormack & Lehane keduanya juga secara signifikan lebih baik dengan iSCOPE 3 ( $p < 0,05$ ). **Kesimpulan:** Skor POGO dan derajat Cormack & Lehane lebih baik dengan iSCOPE 3 dibandingkan AirTraq, sehingga tingkat keberhasilan intubasi, jumlah percobaan, dan kemudahan intubasi secara signifikan lebih baik dengan iSCOPE 3.



**Kata Kunci:** *AirTraq Video Laryngoscope; iSCOPE 3 Video Laryngoscope; Penelitian; Intubasi Tracheal*

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## INTRODUCTION

Endotracheal intubation is a highly taught ability, but painful endotracheal intubation is nonetheless a significant adverse occurrence (1). Video laryngoscopes (VL) have shown promising results in managing difficult airways. Nowadays, a variety of VLs are available on the market. So, it becomes crucial to choose a VL that will be useful in the worst situation of a difficult laryngoscope and intubation. In addition, it should have a high success rate of intubation, require less adjustment manoeuvre, technique which mimics conventional laryngoscopy, be reused, and inexpensive.

We have taken a new video laryngoscope, i.e. the iSCOPE 3 (VYGON), which has a detachable and disposable non channelled blade of Macintosh type, and can be attached to a handle with a screen, and can be rotated up to 180°. The screen can be connected to multiple screens with Wi-Fi. Since it is a newly launched VL, its efficiency as an intubating device in comparison to the well-established AirTraq should be evaluated before iSCOPE 3 can be considered as a part of a difficult airway cart. AirTraq has numerous pieces of literature mentioning its use in DA (2-4) and in patients at low (5) and higher risk (6-8) for difficult tracheal intubation and in simulated difficult airway scenarios in manikins (9).

We postulated that, in contrast to the AirTraq video laryngoscope, the iSCOPE 3 VL makes intubation less challenging due to its operational peculiarities. Therefore, we aimed to compare the iSCOPE 3 video laryngoscope with the AirTraq optical laryngoscope as an intubation aid.

## MATERIAL AND METHODS

The study was carried out at Jawaharlal Nehru Medical College Hospital on 60 patients undergoing elective general surgery under general anesthesia after being approved by the Board of Studies, Department of Anesthesiology, and Institutional Ethical Committee (Ethical clearance: JNMC/IEC/D.No.1548/FM dated October 20, 2018). All study participants provided written informed consent. All patients had a thorough pre-anesthetic check-up, and those meeting the criteria were included in the study. ASA I and II patients of either sex, ages 20-50 with a BMI  $\leq 30$  and all classes of MMP were included in the study.

Two groups of patients were randomly assigned. A computer-based random number generator was used for the randomization process, and the allocation was hidden within sealed envelopes that weren't unsealed until patient permission was received. Patients in Group AT (n = 30; control) were intubated using an AirTraq laryngoscope. Patients in Group IS (n = 30; study) were intubated using an iSCOPE 3 video laryngoscope. If intubation was not achieved, the patient was declared to have failed intubation, and the airway was managed with 2<sup>nd</sup> generation SAD.

The premedication was administered uniformly with injections of midazolam (0.03 mg/kg), ondansetron (0.10 mg/kg), and fentanyl (1 $\mu$ g/kg) as part of a routine anesthetic method. Patients in the operating room were monitored for ECG, pulse rate, SpO<sub>2</sub>, NIBP, and EtCO<sub>2</sub> using a multichannel monitor (Nihon Kohdon). The baseline ECG, pulse rate, SpO<sub>2</sub>, and NIBP were recorded before the induction of anesthesia. Following

81



preoxygenation, anesthesia was induced with Propofol injection (2 - 2.5 mg/kg) and neuromuscular blockade were achieved with Suxamethonium injection 1 - 2mg/kg.

The patients were then intubated with either an AirTraq laryngoscope with installed smart phone over the adaptor to make it a VL. Depending on the allocated group, either the AirTraq laryngoscope (Group AT) or the iSCOPE 3 video laryngoscope (Group IS) was used for intubation. They were initially intubated in a neutral position with or without OLEM (optical laryngeal external manipulation) or airway adjuncts (stylets). If failed, then intubation was done in the sniffing position with or without OLEM or airway adjuncts. Following tube installation confirmation, the trial was terminated. All patients were intubated by the same researcher to avoid observer variability. After intubating ten separate patients and manikins at least twenty times using both devices, the study acquired the learning curve. Both the total number of intubations attempts and the intubation duration were noted by the observer. Any incidents that occurred during intubation, such as injuries to the lips or teeth, were also noted.

We considered a failed intubation if the trachea remained un-intubated after a maximum of three attempts, despite all necessary adjusting maneuvers. The technique was abandoned, and a 2<sup>nd</sup>-generation SAD was inserted as a rescue device, and the case was undertaken.

The intubation time was defined as the duration starting from the blade insertion between the teeth and ending when the endotracheal tube (ETT) was successfully positioned through the vocal chords. An assistant uses a stopwatch to measure time in seconds.

Ease of tracheal intubation was graded as (10):

Grade 1: No extrinsic manipulation of the larynx was required.

Grade 2: External manipulation of larynx was required to intubate.

Grade 3: Failed intubation.

Individually, the frequency of effective intubation was documented for each laryngoscope, both in the neutral and sniffing positions.

POGO Scoring (Percentage of Glottic Opening) (11) is seen while directly visualizing over the screen of the video laryngoscope.

0%: When no glottis structures were visible (not even arytenoids);

33%: Only the lower 1/3<sup>rd</sup> of the vocal cords and arytenoids were visible;

100%: When entire glottis aperture was visualized.

Cormack and Lehane Grading: This was assessed and recorded by the attending anesthetist.

Grade 1: Most of the glottis was visible. No difficulty.

Grade 2: Only the posterior part of the glottis was visible. Pressure on the larynx may improve the view, and intubation was possible with slight difficulty.

Grade 3: The epiglottis was visible, but none of the glottis could be seen. A bougie was used. There was severe difficulty.

Grade 4: There was no visible epiglottis at all. Intubation is usually impossible without special techniques.

The statistical analysis was conducted using IBM SPSS version 20 software. The findings are displayed in the form of numerical numbers, including the mean, standard

deviation, and appropriate percentages. Demographic data between the groups was analyzed using chi square and unpaired t-tests. The data on the duration of intubation was analyzed using an unpaired t-test. The data on the number of attempts and ease of intubation were analyzed using a chi-square test. For all statistical analyses, a significance level of  $P < 0.05$  was used to determine statistical significance.

## RESULTS AND DISCUSSION

The demographic data and preoperative airway examination of patients were similar in both groups ([Table 1](#)). The time of intubation and ease of intubation were comparable between the two devices. However, the number of attempts, POGO score, and Cormack & Lehane grade between the two devices were statistically significant ([Table 2](#)).

**Table 1.** Characteristics of the Patients in Both Groups

Characteristics	Groups		p-Value*
	AirTraq VL N (%) / Mean±SD	iSCOPE 3 VL N (%) / Mean±SD	
Age in years	37.63±8.389	34.60±7.895	0.157
Sex			
Male	15 (25.0)	18 (30.0)	0.436
Female	15 (25.0)	12 (20.0)	
BMI (Kg/m <sup>2</sup> )	23.04±2.01	24.10±2.29	0.064
MP Grade			
I	21 (35.0)	15 (25.0)	0.236
II	6 (10.0)	8 (13.3)	
III	3 (5.0)	7 (11.7)	
ASA GRADE			
I	18 (30.0)	24 (40.0)	0.091
II	12 (20.0)	6 (10.0)	

\*chi-square and independent t-test were used to test proportion and compare means respectively. A p-value <0.05 is considered significant.

The intubation time in patients intubated with iSCOPE 3 was  $19.50 \pm 4.14$  and with AirTraq was  $19.16 \pm 4.21$ , which was similar to previous studies ([12–20](#)). Further, there are studies that reported increased intubation time as compared to our study ([3,17,21–25](#)). The number of patients who were intubated within 15 seconds using AirTraq was 5, while the number using Iscope 3 was 10. As the same researcher was intubating in both groups and also demographic profile was comparable in both groups, the increased time taken with AirTraq could be because the Macintosh blade which is present in iSCOPE 3, had an advantage over AirTraq, although both the devices are rigid. Anesthesiologists typically prefer utilizing the Macintosh blade for rigid

laryngoscopy from the beginning of their anesthetic practice. As a result, the researcher would likely be able to readily make any necessary real-time adjustments during laryngoscopy and intubation using the iSCOPE 3.

However, the AirTraq®, with its prepared curvature and channel for ETT insertion, likely offered limited opportunities for precise modifications with the ETT during intubation. And also, with a mobile adaptor mounted on AirTraq which is fixed, it becomes difficult to manipulate. To make adjustments, the entire assembly, including the device and the ETT, had to be moved. This likely resulted in a rise in the quantity and length of intubation attempts, ultimately resulting in a general



prolongation of the time required for intubation with AirTraQ®. However, one could argue that there was a learning curve associated with the equipment before the study began. The learning curves essentially involve mastering device

manipulation and acquiring intubation techniques. Proficiency is attained quickly with regular and frequent usage of the Macintosh blade.

**Table 2.** Comparison of Intubation Parameters between the AirTraQ and iSCOPE 3 Groups

Parameters	Group		p-Value*
	AirTraQ N (%) / Mean±SD	iSCOPE 3 N (%) / Mean±SD	
Successful intubation	100 (30)	100 (30)	
Intubation time	19.50 ± 4.14	19.16 ± 4.21	0.759
<b>Intubation</b>			
< 15 seconds	5 (16.67)	10 (33.3)	0.136
>15 seconds	25 (83.33)	20 (66.7)	
<b>Number of attempts</b>			
One	21 (70.0)	29 (96.7)	<b>0.006</b>
Two	9 (30.0)	1 (3.3)	
<b>POGO score</b>			
33%	10 (33.3)	2 (6.7)	<b>0.010</b>
100%	20 (77.7)	28 (93.3)	
<b>Ease of intubation</b>			
Grade I	16 (53.3)	24 (80.0)	<b>0.028</b>
Grade II	14 (46.7)	6 (20.0)	
<b>Sniffing position</b>			
Required	7 (23.3)	1 (3.3)	0.052
Not required	23 (76.7)	29 (96.7)	
<b>Total</b>	30 (100.0)	30 (100.0)	

\*chi-square and independent t-test were used to test proportion and compare means respectively. A p-value <0.05 is considered significant.

The current study found that the overall intubation success rate was comparable across the two devices which is similar to the study by Ahmed et al (21). Better results for AirTraQ were also reported by many studies (12,16,26,27). A significant difference was observed in this study with ease of intubation as 80.0% of patients in the iSCOPE 3 group needed no extrinsic manipulation of the larynx compared to 53.3% of patients in the AirTraQ group. Similar to this study, Bogdański et al. (27) and Mathew et al. (22) reported better ease of intubation with other laryngoscopes compared to AirTraQ. However, significantly favorable results for AirTraQ, were reported by many studies (12,20,28) but Raza et al. (16) got

an insignificantly favorable result for AirTraQ. We found significantly better visualization of the larynx by POGO score with iSCOPE 3 in comparison to Airtraq. Results were similar to study, Rao et al. (29) reported that the POGO score was significantly higher (>50%) while using LMA CTrach™ compared to Airtraq® (P = 0.037). However, there are various studies (12,13,15) showed the advantage of using AirTraQ over other laryngoscopes.

We also found a significant difference in Cormack and Lehane grade between the two groups. CL Grade I was observed in 83.3% of patients in the iSCOPE 3 group and in 53.3% of patients in the AirTraQ group (p = 0.020). In accordance with our study, Ferrando et al. (30)



reported significantly better Cormack-Lehane grades for other laryngoscopes compared to AirTraq devices ( $p = 0.04$ ). However, Mathew et al. (22) reported comparable glottis views in both AirTraq and the Macintosh group ( $p = 0.269$ ). Contrary to our study, significantly better results for AirTraq compared to other laryngoscopes were observed in various studies. (15,28,31,32) In the present study in AirTraq 7 patients required sniffing positions, whereas in iSCOPE 3, only 1 patient required sniffing positions ( $p = 0.006$ ). This could be due to the less manipulation required by iSCOPE 3 as the screen can be rotated for adjustment, whereas in AirTraq, for better visualization, more adjustment and maneuvering are required.

Therefore, it could be inferred from the above discussion that, for predicted easy laryngoscopy and intubation, both devices had outstanding intubation performances. Whereas iSCOPE 3 is a new device with no literature available related to its use, in our study we could not compare it with the results of any other research. However, the intubation parameters were comparable with the AirTraq in our research. However, in terms of number of attempts and POGO scoring, we get better results with iSCOPE 3.

The present study has a few limitations. Initially, it was not feasible to prevent the anesthesiologist from being aware of the devices because they had distinct variations in their shape and size. So, this study had the potential for observer bias. Furthermore, the study exclusively focused on elective general surgical patients, therefore, the findings cannot be extrapolated to emergency room procedures or other specific populations such as obstetricians, obese individuals, or those with cervical immobilization. Hence, the application

of our results in such patients may not be justifiable.

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## CONCLUSION

Our analysis indicates that both devices exhibit high rates of successful intubation. However, iSCOPE 3 outperforms AirTraq regarding intubation attempts, ease of intubation, achieves superior POGO, scores and Cormack-Lehane grades. Further studies should be done with a large sample, a multicentric approach, and among difficult patients in emergency situations to get a better comparative analysis.

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## Conflict of Interest

The authors declare no competing interests.

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None

## Authors' Contributions

Sania Parveen and Syed Moied Ahmed contributed in Concepting, designing, definition of intellectual content, literature searching, data acquisition, data analysis, statistical analysis, manuscript preparation, editing, and review.

Mohd Najmul Aqib Khan contributed in literature searching, data analysis, statistical analysis, manuscript preparation, editing, and review.

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