Original Article

Comparison of double lumen tube insertion using the McGrath MAC versus direct laryngoscopy in adult patients with a limited glottis view: A prospective interventional study

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Abstract

Background and Aims: Passage of double-lumen tubes (DLT) can be challenging in patients with limited glottis view. This study aims to determine the usefulness of McGrath® MAC videolaryngoscope (VL) in cases with limited glottis view on direct laryngoscopy with Macintosh blade.

Material and Methods: After study approval and registration of trial, consent was sought from all adult patients planned for elective DLT insertion for lung isolation during the course of general anesthesia. Patients not consenting, less than 18 years, with anticipated difficult mask ventilation or need for rapid sequence induction were excluded. Following routine anesthetic induction, laryngoscopy was attempted by an experienced anesthesiologist using Macintosh scope. If the view obtained was Cormack and Lehane (CL) view IIB and above or the attempt at intubation using DLT failed despite a CL I/IIA view, the patient was included in the trial. The laryngoscope was removed and after ensuring adequate oxygenation and depth of anesthesia, intubation was attempted using McGrath® MAC VL. The percentage of glottis opening (POGO) score was noted for both the scopes.

Results: DLT insertion was attempted in 76 patients in the study period. Eight patients were included in the trial on account of limited glottis view/failure with Macintosh scope. Insertion of DLT with McGrath MAC was tried only in six patients, in two patients, the VL was not available for use. The mean (standard deviation) POGO score with Macintosh scope was 9 (±20), which significantly improved with the use of VL to 71 (±24), $P = 0.01$.

Conclusion: McGrath MAC is helpful in inserting DLT in patients with limited glottis view with Macintosh scope.

Keywords: Difficult airway, double-lumen tubes, videolaryngoscope

Introduction

Double-lumen tubes (DLTs) are considered the gold standard for airway management in surgeries needing lung isolation.[1] The pre-shaped and larger diameter of DLT makes the intubation process more difficult than the standard endotracheal tube.[2] Passage of DLT gets difficult in case of limited glottis view. Intubation with a limited view is often associated with trauma and very rarely leads to dislocation of the arytenoid cartilages and even tracheal rupture.[3] Video laryngoscopes (VL) have revolutionized airway management and the role in difficult airway is now established.[4] In this study, we planned to evaluate the role of videoscopes in passage of DLT in difficult airways and in cases in which standard scopes have failed. The primary objective was to evaluate success at intubation with a DLT using videoscope in patients with Cormack and Lehane* (CL) grade IIB with standard scope or CL grade II A view with failure of intubation. Secondary

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objective included analysis of incidence of any airway related complications.

Material and Methods

After approval of the institutional review board and registration with the Clinical Trial Registry of India (CTRI/2014/11/005226), this prospective interventional single arm study was initiated. Since the glottis view cannot be predicted with certainty, consent was sought from all patients planned for elective DLT insertion for lung isolation during the course of general anesthesia. Patients not consenting, less than 18 years, with anticipated difficult mask ventilation or need for rapid sequence induction were excluded. A pre-anesthetic and airway evaluation was done for all patients prior to surgery and based on standard clinical parameters (Modified Mallampati classification (MMC) III and IV, thyromental distance less than 6.5 cm, sternomental distance less than 12.5 cm, inter-incisor gap less than 3 cm, restricted neck extension), the airways were classified as anticipated difficult or normal airways.[5] The study period lasted for six months and no formal sample size calculation was needed in view of the study design.

In the operating room, after attaching monitors (electrocardiogram, non-invasive blood pressure monitoring, and saturation probe), checklist, and pre-oxygenation, patients received general anesthetics as per the choice of the concerned anesthesiologist's team. The initial attempt at DLT insertion was with a standard Macintosh laryngoscope. If during laryngoscopy, the experienced intubator (more than 50 intubations with standard laryngoscopy) found Cormack and Lehane (CL) view IIB and above or encountered a failure for the passage of tube with a CL I/IIA view, the patient was included in the trial.[6] After removal of the laryngoscope, the lungs were ventilated with 100% oxygen, and intubation was attempted using the McGrath MAC blade. A failed attempt with the VL was defined as failure to pass the DLT within a maximum time limit of 150 s or fall of saturation below 92% whichever was earlier. In case of failure to intubate with McGrath MAC, airway management decision included trial with a single-lumen tube or double-lumen tube with any technique at the discretion of the anesthesiologist, ensuring adequate oxygenation and anesthetic depth at all times.

In case the DLT was successfully placed with McGrath MAC VL, its placement was confirmed by capnography, clinically and using a fiberoptic bronchoscope. Complications inclusive of bronchospasm, airway trauma during the course of intubation were noted for the patients in whom intubation with VL was attempted. The need for external laryngeal manipulation and the lowest value of arterial oxygen saturation was captured. The laryngeal view with both scopes—McGrath MAC and Macintosh laryngoscope—was noted using the percentage of glottis opening (POGO) score.[7] The experience of the intubator with respect to previous intubation with McGrath MAC scope for single-lumen tube and DLT was noted as either less than 6, 6–20, and more than 20 intubations with the VL. Following surgery, the patient was evaluated in the post-anesthesia care unit for symptoms of sore throat and hoarseness on a numeric rating scale of 0 (no hoarseness)–10 (significant hoarseness).

Statistical Analysis

The success rate at intubation with the VL was expressed as a percentage. The glottis view between the two scopes was compared using paired student 't' test. Complications (airway trauma, bronchospasm, DLT damage) were expressed as percentages. For analysis, the score for sore throat and hoarseness was clubbed as 0–nil, 1–3 mild, 4–6 moderate, and 7–10 severe. All data were expressed as a percentage. All the analyses were done using IBM® SPSS V. 21 and results with a P value < 0.05 were considered as statistically significant.

Results

All patients undergoing thoracic surgeries were screened during a 6-month period—Dec 2014 to April 2015, Figure 1. Out of the 76 patients in whom DLT placement was attempted, difficult airway was anticipated on clinical grounds in 12 patients. In the remaining patients (64), limited glottis view was encountered during direct laryngoscopy in 2 patients. Though we had eight failures with Macintosh, insertion of DLT with McGrath MAC was tried only in six patients; in two patients the scope was not available for use. Relevant patient details have been summated in Table 1. The mean (standard deviation) POGO score with Macintosh scope was 9 (±20), which significantly improved with the use of VL to 71 (±24), $P = 0.01$. Airway complication mainly trauma was seen in two cases, refer to Table 1. In one case, the mediastinal mass involved the pericardium and surgical removal involved major blood loss. The patient was electively ventilated for a short period after surgery. In the remaining patients, the tracheal tube was removed in the operation room. Sore throat and hoarseness were mild in all cases.

Discussion

In this study, we found that in patients with limited glottis view with standard Macintosh scope, intubation with McGrath MAC scope assures successful DLT negotiation beyond the

Table 1: Patient demographics and airway details for cases with successful DLT placement with McGrath MAC scope

Age	Gender	BMI	MMC	CL view	POGO STD	Low Sat1	POGO McG	Low Sat2	ELP	DLT size/side	Complications During scopy	Experience with VL	Sore throat	Hoarseness
60	M	25.5	II	4	0	80	100	100	yes	39-L		>6	NA	NA
60	M	23.7	IV	3	0	99	80	99	yes	37-L		6-20	-	-
66	M	24.8	IV	3	5	99	95	92	yes	39-L	Blood on VL blade	>6	0	2
55	F	21.8	IV	2	50	95	50	100	yes	35-F	Dental extraction during first intubation with Macintosh scope	6-20	-	-
63	M	23.0	II	3	0	100	50	100	yes	37-L		6-20	2.5	1
57	M	26.8	II	3	5	98	90	89	no	39-L		>6	-	-

BMI - Basal Metabolic Index, Modified Mallampati Classification, CL - Cormack and Lehane view at laryngoscopy. POGO STD, POGO McG - laryngoscopic view using POGO scoring with Macintosh scope, McGrath MAC scope respectively.Low Sat1, Low Sat2 - Lowest saturation recorded during intubation with Macintosh scope and McGrath MAC scope respectively. Experience with VL- experience of intubator with the use of McGrath MAC for single-/double-lumen tube in the past. Sore throat and hoarseness recorded using Numeric Rating Scale, NRS (0-10-10 worst symptoms) NA- Not assessed as patient was ventilated in the post-operative period

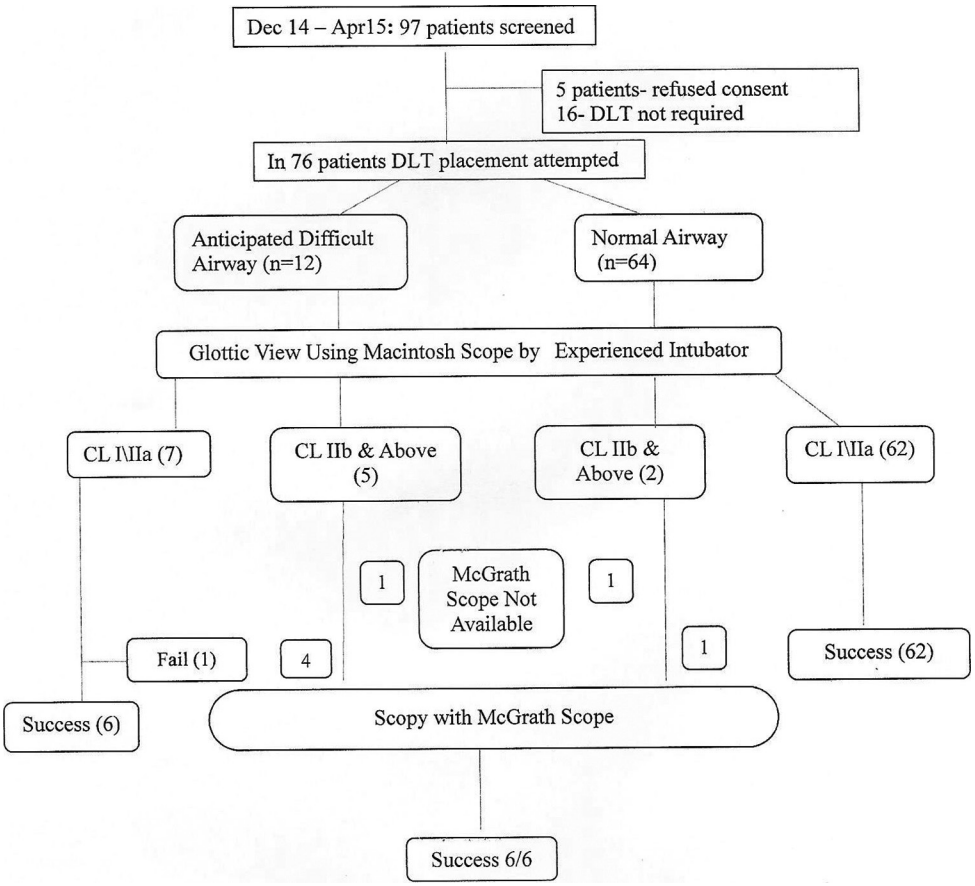

Figure 1: Consort diagram with respect to inclusion of patients in the trial

vocal cords. The glottis view significantly improves with the use of the VL.

Previous studies have evaluated the role of VL in the placement of DLTs in difficult airways.[8,9] In a few studies, simulators or mannequins were used to replicate difficult airway situations.[8] In trials inclusive of patients with difficult airway, clinical airway predictors were being used to assess the difficultly at intubation inclusive of neck distances, Mallampati classification.[9] However, it has been seen that bedside airway tests are poor predictors of difficult visualization of glottis. Only in 3–5% of the patients with Mallampati class 3 view of the oropharynx, a difficult laryngoscopy is encountered.[10] Out of the 76 consenting patients, inclusion criteria for our study were met in only 8 patients. With a recruitment rate of as low as 10%, we could include very few patients in the trial. This was the result of the stringent inclusion criteria that patients with limited glottis view or failure at intubation with Macintosh scope were only included.

Despite the small number of cases, we had a success rate with the use of McGrath MAC scope. The blade design of the

VL could explain the results. The McGrath® MAC blade retains the same shape and curvature as the Macintosh blade. This provides the necessary space for the introduction and easy placement of the DLT while offering a clear image of the glottis opening.[11] In a previous study, anesthetists took a longer time to intubate with the GlideScope and they found it more difficult to pass the DLT with the VL when compared to the Macintosh laryngoscope.[12]

In a study, similar to ours, Lin WQ, *et al.*[2] have demonstrated the successful use of CEL-100 videolaryngoscope (TM) for double-lumen tracheal tube insertion after failure in using the Macintosh laryngoscope. They have reported an overall success rate of 90% with the use of CEL-100, with 56% success at the first attempt, 29% at the second attempt, and 4% at the third. In a study comparing the performance of six different VL in simulated difficult airways, McGrath™ (Aircraft Medical Ltd, Edinburgh, UK) (98%) and C-MAC™ (Karl Storz, Tuttlingen, Germany) D blade (95%) showed a high rate of first attempt success rate with the least tissue trauma highlighting the importance of VL blade design.[13] This study was a multicentric trial in patients with a cervical collar and a single lumen tube was used. It is extremely difficult to have similar evidence with respect to intubation using DLT in patients with limited glottis view and different VLs. However, one must also remember that in extreme difficulty in the insertion of DLT, a combination of the fiberoptic bronchoscope and VL can also be tried.[14]

Conclusion

McGrath MAC is helpful in inserting DLT in patients with limited glottis view with standard Macintosh scope. We recommend using McGrath MAC videolaryngoscope as a rescue device for DLT placement in difficult intubation scenarios.

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Conflicts of interest
There are no conflicts of interest.

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