Nasotracheal intubation with MacGrath videolaryngoscope using Schroeder directional stylet: Case series

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Abstract

Background and Aims: MacGrath videolaryngoscope is one of the recent videolaryngoscopes, which can be used to facilitate nasotracheal intubations using Scroeder directional stylet.

Material and Methods: 15 patients, American Society of Anesthesiologists Grades I-II, undergoing tonsillectomy, requiring nasotracheal intubation were included. All patients were intubated with MacGrath videolaryngoscope and Schroeder stylet. Primary outcome measures were duration and ease of intubation. Overall success rate, number of attempts, modified Cormack-Lehane (C-L) grading, and complications were also recorded.

Results: All 15 intubations were successful during first laryngoscopy attempt. C-L Grade I views were obtained in 14 patients (93%) and Grade II view in one patient (7%). The time required to obtain the best C-L view was 9.4 ± 1.5 s. The time taken to complete tracheal intubation was 34.27 ± 3.38 s. Average numerical rating scale for tracheal intubation was 8.7 ± 0.9. Minor complications occurred in four patients (26.7%).

Conclusions: MacGrath videolaryngoscope produces excellent laryngoscopic views in patients with normal airways. Impaction of tracheal tube on posterior nasopharyngeal wall can be overcome by Schroeder stylet.

Key words: MacGrath videolaryngoscope, nasotracheal intubation, Schroeder stylet

Introduction

Videolaryngoscopes are relatively new devices available for intubation, which provide several potential advantages over direct laryngoscopy including better views of the larynx,[1-3] particularly in patients with limited cervical spine motion,[4,5] reduced tracheal intubation time,[4] and educational value.[6,7] MacGrath videolaryngoscope (Aircraft Medical, Edinburgh, UK) is a relatively new device.

The aim of our study was to evaluate the efficacy of MacGrath videolaryngoscope in nasotracheal intubation using Schroeder directional stylet. We hypothesized that better glottic view and changing curvature of the endotracheal tube would make nasal intubation easy with these devices.

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Material and Methods

After obtaining approval from the Institutional Ethical Committee, 15 adult patients undergoing tonsillectomy requiring nasotracheal intubation were recruited. We included patients if they were >18 years of age, American Society of Anesthesiologists Grades I and II, and had a modified Mallampati score of 1 or 2.[8]

Exclusion criteria included the presence of predictors of difficult intubation, including decreased inter-incisor distance (<3 cm), short thyromental distance (<6 cm), and reduced neck extension (<80° from neck flexion), cervical spine instability, or risk of pulmonary aspiration. The primary outcome measures were duration and ease of intubation. We also recorded overall success rate, number of attempts, modified Cormack-Lehane (C-L) grading and complications.

After obtaining written informed consent, baseline characteristic data were collected before operation. Each patient

was premedicated with dexamethasone 4 mg, midazolam 0.05 mg/kg, fentanyl 2 μg/kg and glycopyrrolate 0.02 mg. Xylometazoline 0.05% nasal drops were instilled in both the nares. After preoxygenation with 100% O_2, anesthesia was induced using the drugs of the treating anesthetist's choice. The lungs were then ventilated with 100% O_2 using a bag and a mask, and laryngoscopy was attempted. The adjustable-length laryngoscope blade was set to the midpoint.

The McGrath® videolaryngoscope series five was inserted into the patient's mouth along the midline of the tongue, and the blade was advanced until the larynx became visible on the screen. A standard oral tracheal tube was used (size 6.5 for females and size 7.5 for males). A well-lubricated Schroeder directional stylet (SteBar Instrument Corp., Grand Rapids, MI, USA) was passed into the tube. When the vocal cord was visible on liquid-crystal display monitor of the laryngoscope, endotracheal tube with Schroeder stylet was inserted into one of the nares. After negotiating through nasopharynx and subsequently oropharynx, the tip of the tube was visible on screen. Then the lever on the proximal end of the Schroeder stylet was depressed, which led to alteration of the curvature of the stylet with consequent anterior flexion of the tube leading to its smooth navigability anteriorly towards the vocal cord. After passing the tube through the glottic opening, which was visualized on the video screen, the lever of the stylet was released and the stylet was then removed and the nasotracheal tube was further guided into the trachea, achieving successful nasotracheal intubation.

Duration of intubation, as well as the ease of intubation was recorded. The duration of intubation was defined as time from when the videolaryngoscope was inserted into the participant's mouth until end-tidal CO_2 was detected. The ease of intubation was graded by the intubating anesthetist on a numerical rating scale (NRS, where 0 was the most difficult and 10 the easiest).[9] The best laryngoscopic view obtained using the C-L classification, number of attempts at laryngoscopy required to intubate the trachea (insertion and removal of the laryngoscope counted as one laryngoscopy), any airway complications, episodes of hypoxia (SpO_2 <92%) and/or equipment failure were also recorded. During desaturation or failure to intubate, patient was intubated through oral route using the same videolaryngoscope. If intubation was still not possible, direct laryngoscopy and intubation was done.

Results

Data were collected from 15 patients who required tracheal intubation for tonsillectomy. Patient characteristics and the results of the preoperative airway assessment are shown in the Table 1. Tracheal intubation was successfully completed in all patients using the McGrath® videolaryngoscope, and all 15 intubations were successful during first laryngoscopy attempt. C-L Grade I views were obtained in 14 patients (93%) and Grade II view in one patient (7%). The time required to obtain the best C-L view was 9.4 ± 1.5 s. The time taken to complete tracheal intubation was 34.27 ± 3.38 s. Average NRS for tracheal intubation was 8.7 ± 0.9. Minor complications occurred in four patients (26.7%): Oxygen saturation decreased below 92% in one patient, and airway trauma was observed in three patients.

Discussion

This case series demonstrates a high success rate of nasotracheal intubation in adult patients with MacGrath videolaryngoscope using Schroeder's directional stylet. The average time taken to complete tracheal intubation was 34.27 ± 3.38 s. This duration of intubation is less than the other reported studies. Ng *et al.*[9] have reported 67 s to intubate with McGrath in potential difficult airways. According to Jeon *et al.*[10] tracheal intubation time is 40.5 s. Hirabayashi and Seo[11] in their study have reported nasotracheal intubation time with Airtraq and Macintosh laryngoscope was 15 ± 11 s and 13 ± 6 s, respectively. This relatively shorter time for intubation might be due to nonuse of the stylet. Removal of the stylet, after intubation, might have increased the time in our study. However, we did not find any significant studies reporting nasal intubation with MacGrath videolaryngoscope using Schroeder stylet.

Table 1: Patient characteristics and airway assessment

Parameters	All patients (%)
Age (year)	28.2±4.66
Gender (male:female)	9:16
Weight (kg)	55.27±5.22
Number of attempts	
1	15 (100)
2	0
3	0
C-L grade	
1	14 (93)
2	1 (7)
3	0
Time required to get best C-L view (s)	9.4±1.5
Time required for complete tracheal intubation (s)	34.27±3.38
NRS for tracheal intubation	8.7±0.9
Complications	4 (26.67)
SpO_2 <92%	3
Airway trauma (tongue-lip-dental trauma due to insertion of videolaryngoscope; turbinates-septal trauma due to insertion of ETT)	1

Data are mean ± SD or number of patients (%). C-L = Cormack-Lehane, NRS = Numerical rating scale, SpO_2 = Oxygen saturation, ETT = Endotracheal tube, SD = Standard deviation

The average NRS of tracheal intubations was 8.7. Ng *et al.*[12] also reported similar result in their study with normal airway situation. According to them, ease of intubation was 8 in rating scale and it is comparable to our study. We have 100% overall success rate with MacGrath. Shippey *et al.*[13] also reported similar success rate, but in their study, they intubated patients through orotracheal route. All our patients were intubated on the first attempt, which is similar to the studies of Walker *et al.*[14] where they stated 97% success rate on first attempt with MacGrath. We found C-L Grade I in 93% (14 of 15 patients), which is similar to other studies on MacGrath.[13,14] Complication rate in our study was much higher than other studies.[9,14] We believe that two reasons account for these higher rate of complications. First, due to the small sample size of our study, even a small number of complications will lead to the high percentage. Second, chances of airway trauma is more while intubating a patient through nasotracheal route compared to the orotracheal route.

We acknowledge the limitations in drawing conclusions from a case series reported from a single center. Patients were unselected, not enrolled consecutively, no control group was used, and measurements were not blinded. However, we collected data consistently, prospectively and according to a protocol designed before the case series began. This approach should reduce any potential bias, and as no patient was withdrawn from the case series, should mitigate against problems of data interpretation. Nevertheless, we believe that this case series provides useful clinical information about the nasotracheal intubation with McGrath® videolaryngoscope using Schroeder directional stylet.

Conclusion

The compact, fully self-contained, and portable McGrath® videolaryngoscope produces excellent laryngoscopic views in patients with normal airways. Impaction of tracheal tube on posterior nasopharyngeal wall was overcome by Schroeder stylet.[15] By increasing the curvature of the tube using this stylet, negotiation of the tube through the nasopharynx becomes easier. Furthermore, tracheal tube cuff damage is possible while grasping the tube with Magill's forceps. We excluded this possibility by using Schroeder stylet. Also removal of Schroeder stylet is easier than removal of malleable stylet. Finally, randomized controlled trials are warranted to compare the utility of this device compared with other videolaryngoscopes and advanced airway devices in patients undergoing nasotracheal intubation.

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