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LMA CTrach™ in patients with anticipated difficult airway: A retrospective study

***HM Krishna*[1*], *N Joseph*[2], *PK Reddy*[2], *Y Dudeja*[2]**
Professor[1], *Postgraduate*[2], *Department of Anaesthesiology, Kasturba Medical College, Manipal, India.*

***Corresponding author:** hmkrishna20032002@gmail.com*

LMA CTrach™, a newer airway conduit, with its ability to ventilate and intubate is the ideal device for airway management for difficult airways. A retrospective study was conducted to evaluate the efficacy of this airway device in patients with anticipated difficult airway. 250 patients in whom LMA CTrach™ was used for endotracheal intubation was analyzed. These patients were analyzed for anticipated difficult airway, success rate of intubation with LMA CTrach™, difficulties encountered and corrective measures applied. Fifty five patients had predictors of difficult airway and LMA CTrach™ was successful in all but one. Although successful intubation was achieved with LMA CTrach™, difficulty in intubation was encountered in six patients. This could be overcome with excessive pressure, correctional manoeuvers or a larger size LMA CTrach™. The most common predictors of difficult airway encountered were Modified Mallampati class 3, restricted extension, restricted mouth opening of two finger breadths and retrognathia. LMA CTrach™ is a useful airway device in a difficult airway scenario with the ability to ventilate and intubate the patient.
Keywords: LMA CTrachTM; difficult airway; modified mallampati class 3; retrognathia

Introduction

LMA CTrach™(The Laryngeal Mask Company, Singapore) is a newer generation intubation conduit. Successful intubation and better quality oxygenation should be much higher in LMA CTrach™ with its ability to ventilate along with assisting in intubation.[1] Moreover, the design which involves the utilization of an airway device certified for difficult airway management as a conduit for endotracheal intubation makes it an ideal device for difficult airway management. However, the benefit of LMA CTrach™ as a backup device for difficult airway is an area that still needs to be explored. In this retrospective study, we analyzed the data of 250 patients for whom LMA CTrach™ was used for airway management and determined how successful it was in patients with anticipated difficult airway.

Materials and methods

This retrospective study was commenced with the data procured from the department of anaesthesia database after obtaining approval from the hospital ethics committee. Data of patients for whom LMA CTrach™ was used or attempted for endotracheal intubation for elective surgical procedures during the period from July 2012 to November 2014 was extracted. In all the cases anaesthesia was induced with intravenous anaesthetic agent and muscle relaxants were used to aid intubation. After retrieval of data, the patients were referred to only by serial numbers and the anonymity was maintained. Individual consent of the patients for data analysis and publication was waived off.

Data of patients were then analyzed for any predictors of difficult airway. These predictors included retrognathia, inter incisor distance less than or equal to 3 finger breadths, modified Mallampati class III or IV, thyromental distance less than 3 finger breadths, restricted neck movements and/ or short neck.[2] The success of LMA CTrach™ in these patients with anticipated difficult airway was recorded. The data retrieved from these patients comprised of patient characteristics, identified predictors of difficult airway, success of LMA CTrach™ in endotracheal intubation, number of attempts required to attain successful intubation with LMA CTrach™, grade of glottic view with LMA CTrach™, maneuvers used if any to obtain better glottic view/assist in intubation, if intubation failed with LMA CTrach™ whether direct laryngoscopy was successful or the

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method by which airway was managed, adverse events if any.

With this data we aimed to find (a) success rate of intubation with LMA CTrach™ in patients with predictors of difficult airway and

(b) maneuvers that facilitate intubation through LMA CTrach™ in anticipated difficult airway.

Results

During the study period, LMA CTrach™ was used for endotracheal intubation in two hundred and fifty patients undergoing various elective surgical procedures. Among these patients, fifty five patients were identified as having predictors of anticipated difficult airway. These included retrognathia, restricted neck extension, modified Mallampati class 3 and restricted mouth opening of less than or equal to 3 finger breadths. Patients also had more than one predictor of difficult airway. The incidence of predictors of difficult airway in the study population was twenty two percent. In all the cases, after induction of anaesthesia with intravenous agents and confirming bag and mask ventilation, either vecuronium, atracurium or succinyl choline was administered to facilitate intubation. LMA CTrach™ was successful in intubation for all but one of these patients (Table 1). Direct laryngoscopy was used for intubation in this patient. This patient had retrognathia and the best view of the glottis obtained through the LMA CTrach™ was grade 4 view even after multiple manoeuvers and changing to a larger size LMA CTrach™. A single attempt at intubation was tried with LMA CTrach™ and then abandoned in view of multiple attempts. LMA CTrach™ was found to be successful in intubating ninety eight percent of patients with predictors of difficult airway. Out of the fifty four patients intubated, six patients had difficult intubation using LMA CTrach™(Table 1).

Table 1: Predictors of difficult airway in patients with difficult intubation using LMA CTrach™ and the final grade of glottic view obtained

Case No.	Difficult airway predictors	Final grade of glottic view
1.#	Retrognathia	4
2.	Modified Mallampati class 3	1
3.	Restricted extension, Modified Mallampati class 3	1
4.	Modified Mallampati class 3	3
5.	Modified Mallampati class 3	1
6.	Restricted extension	1
7.	Restricted extension	1

failed to intubate with LMA CTrach™

Intubation using LMA CTrach™ was defined as difficult if there was hinging at laryngeal structures requiring maneuvers or more than one attempt was required for successful intubation or excessive pressure was required during intubation as observed by the person performing intubation. In two patients with difficulty, intubation was successful on first attempt with excessive pressure (more than the routine pressure required to push the tracheal tube through the LMA during intubation as perceived by the operator performing intubation). Two attempts were required in three of these patients with maneuvers applied in the second attempt to align the tube better with the glottic opening (Table 2).

Table 2: Correcting manoeuvers applied to improve glottic view#

Correcting Maneuvers	Number of patients
Up and down manoeuver	30
Optimization of insertion length (push in or pull out)	18
Suctioning, reinsertion, cleaning optics or focusing	8
Up and down manoeuver + Chandy manoeuver	4
Rotational manoeuver	2
Chandy manoeuver	1

#more than one of the above manoeuvers for multiple times may have been applied to the same patient

Chandy manoeuver and rotational maneuver were most commonly used for alignment during intubation (Table 3).

Table 3: Correcting manoeuvers applied to facilitate intubation#

Correcting Manoeuvers	Number of patients
Rotational manoeuver	3
Chandy manoeuver	3
Distal manoeuver	1
Lubrication of tube	1

#more than one of the above manoeuvers for multiple times may have been applied to the same patient

In the remaining one patient who was edentulous and had restricted extension, three attempts were required for successful intubation. Eighty seven percent of the patients could be easily intubated using LMA CTrach™. All attempts were made to attain a grade 1 LMA CTrach™ view of the glottis prior to intubation. The up a[illegible] manoeuver was most commonly used t[illegible] the same (Table 2). The grading proposed by Timmerman et al was used.[3] Among the fifty five patients studied; grade 1 glottic view could not be attained in 15 patients despite corrective manoeuvers. However, only two of these patients encountered difficulty in intubation with LMA CTrach™. In fact, in one of these patients, intubation using LMA CTrach™ had to be abandoned and completed with direct laryngoscopy. The most common predictors of difficult airway encountered in descending order were modified Mallampati class 3, restricted extension, mouth opening of two finger breadths and retrognathia.

Discussion

The LMA CTrach™, a modification of the LMA Fastrach™, has the added advantage of continuous video endoscopy view of the entire intubating procedure. It consists of a curved LMA with the airway tube, epiglottis elevating bar and the detachable LCD viewer.[4] It has two inbuilt fibreoptic channels that enable to view the image in the LMA CTrach™ viewer.[5] The location of the lens behind the epiglottis elevating bar enables to view the anatomy anterior to the bar. It is one of the few devices that enable ventilation during the intubation procedure thereby assuring less panicky situations for both the patient and the anaesthesiologist.[1]

In addition to the direct view of the laryngeal passage, the LMA CTrach™ enables the visualization and the correct positioning of the tracheal tube during intubation. Due to the arytenoid and cord damage that can be sustained during blind intubation via the LMA Fastrach™, it was proposed to utilize fibreoptic bronchoscope. This made the process more cumbersome.[6,7,8] However, the newer LMA CTrach™ has the added advantage that it can be managed independently, making it a potential instrument in emergency airway management. Oesophageal intubation, a potential complication of blind intubation through the LMA Fastrach™, should be overcome by the direct visualization of the glottis in LMA CTrach™ with its better ability to align the laryngeal inlet.[1]

In our study we were able to successfully intubate fifty four patients out of the fifty five patients with anticipated difficult airway. The most common difficulty encountered in attaining a grade 1 view of the glottis was the down folding of the epiglottis. However, this was successfully corrected in majority of the patients with the application of the up and down maneuver. The bend of the LMA CTrach™ airway tube with its increased diameter did cause difficulty in negotiation during insertion. This is mostly due to its width with the inbuilt fibreoptic bundle. This was overcome in three patients with lateral insertion. The failure to succeed with one patient could be attributed to inadequate preparation of patient. Although a grade 4 view was obtained in this patient with a larger size LMA CTrach™, it was clear that this was due to collection of secretions. A grade 1 view was obtained after suctioning which could not be maintained. A provision for continuous suctioning could probably overcome this situation. The difficult intubations were encountered mostly due to improper alignment of the glottic opening and the tube. Once appropriate manoeuvers were applied this difficulty was surmounted. It was observed that the success rate of intubation had no correlation with the glottic view obtained. Although it was postulated that a grade 1 view greatly increased the chances of a successful and easy intubation with fewer traumas to the laryngeal structures, our study failed to show the same. In fact, 86.67% of patients who had less than a grade 1 glottic view with LMA CTrach™ had easy intubations. However the sample population is too small to comment on the same. Although manufacturer recommends the size of LMA CTrach™ to be determined on the basis of the patient's weight, in two patients a reinsertion of a larger size LMA CTrach™ was needed. In one of these patients this failed to improve the glottis view and intubation failed. This requirement for a larger size could be due to the longer oral pharyngeal laryngeal distance which requires a deeper insertion.[9] In the edentulous patient, maintaining the position of the LMA CTrach™ might have been difficult thus necessitating 3 attempts.

Though multiple case reports have been published stating the success of LMA CTrach™

in difficult airway situations, a comprehensive study evaluating the above is lacking. Liu et al in their study of 48 patients with difficult airway have reported that in three patients where difficulty in ventilation and intubation was encountered, LMA CTrach™ was successful as a rescue device. However, in two of these patients they decided against intubation in view of failure to visualize the glottis. Similar findings to our study were found with increased success of LMA CTrach™ in patients with retrognathia, restricted neck movements, short thick neck and maxillary overbite. In their study LMA CTrach™ was attempted only after the difficulty was encountered and other conventional methods had failed.[10] The LMA CTrach™ has even found to be successful in obese patients and other patients with difficult airway for awake intubation.[3],[11,12] In awake intubation, Lopez et al stated that the procedure was tolerated well by the patients and in fact oxygenation improved in some patients with LMA CTrach™ insertion. Nevertheless the procedure was found to be time consuming in comparison with the gold standard fibreopticbronchoscope.[14] However there is concern regarding the use of LMA CTrach™ in patients with cervical injury and obese patients. This is due to the apprehension regarding the pressure exerted by the LMA CTrach™ on the upper cervical vertebra and the inability to completely prevent neck movement by manual stabilization.[14] In obese patients, a few reports have stated that manipulations of LMA CTrach™ have led to aspiration of regurgitated contents.[15] LMA CTrach™ also has the limitation that it cannot be used in patients with oropharyngeal growths and in patients with inter incisor distance less than 25mm. In patients with lose teeth or gaps, the insertion and manipulations of LMA CTrach™ can cause damage to the teeth.

Our study has evaluated the success of LMA CTrach™ in a population with predictors of difficult airway. Our study included population of different ages and with multiple predictors in the same individual. It has only given a perspective into the possible future that LMA CTrach™ holds in the arena of difficult airway. Our study has its own drawbacks. This was a retrospective study where LMA CTrach™ was used electively. There is no confirmation as to whether they were a real difficult airway situation because direct laryngoscopy was not performed prior to the use of LMA CTrach™. Moreover the LMA CTrach™ was used by individuals experienced in using it. This same success rate cannot be guaranteed when extrapolated to a population of less experienced operators. In addition, the predictors of difficult airway like retrognathia and restricted extension were subjective and not quantified.

We conclude that LMA CTrach™ can be a helpful alternative device in patients with anticipated difficult airway, particularly in patients with modified Mallampati class 3 and restricted neck extension. However further studies comparing it with other newer video laryngoscopes needs to be conducted to validate the same.

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