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CASE REPORT

Use of the Combitube as a Rescue Airway during a Case of "Can't Ventilate – Can't Intubate (CVCI)" in the Operating Room when a Laryngeal Mask failed.

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ABSTRACT

Objective: To describe a case of "can't ventilate – can't intubate" with failed insertion of a laryngeal mask.

Case: A 46-year-old obese white female with a short neck was scheduled for excision of a thyroid goiter. One hour following extubation a hematoma of the right anterior neck was noted. Immediate intubation was mandatory. While fiberoptics failed, a blind attempt at inserting an endotracheal tube resulted in esophageal intubation. An interscor distance prevented insertion of a number 3 LMA. An esophageal Combitube™ (ETC) 37 F SA (Tyco-Healthcare-Kendall, Mansfield, MA;

www.combitube.org) was then inserted blindly. Oxygenation saturation rapidly improved and could be maintained at 97 % with an FiO₂ of 1.0. General anesthesia was completed and the hematoma was evacuated. Following evacuation of the hematoma ventilation improved as peak airway pressures declined.

Conclusion: The superiority of the Combitube in this case is due to its slim design thereby surpassing the laryngeal mask airway. The Combitube should be considered as an additional tool for managing the patient's airways under difficult circumstances

Key Words: Combitube, laryngeal mask airway, fiberoptics, cannot ventilate – cannot intubate, goiter, hematoma

INTRODUCTION

The can't intubate – can't ventilate situation may be a challenge for the anesthesiologist. This situation requires the presence of a skilled anesthesiologist and suitable equipment. Equipment includes alternate airways such as fiberoptics, laryngeal mask airway, Combitube, etc. In the following a can't ventilate - can't intubate situation is described where the laryngeal mask airway failed.

CASE REPORT

A 46-year-old white female was scheduled for excision of a thyroid goiter. She had a short neck and limited range of motion of the temporal mandibular joints. She weighed 95 kg and was 160 cm tall. Upon laryngoscopy she was noted to have a grade III Lehane and Cormack view. Intubation was successful on the second attempt. At the end of surgery she was awakened and extubated uneventfully and transferred to the post anesthesia care unit.

One hour following extubation a hematoma of the right anterior neck was noted and the surgeon was notified. Fifteen minutes later she was returned to the operating room for evacuation of the hematoma. Her breathing was slightly stridorous and labored and she complained of dyspnea. She was visibly restless. Her mouth opening was visibly restricted to less than 2.5 cm. Her tongue was

so swollen that she could not stick it out.

Preoxygenation improved her oxygen saturation from 87% to 95% within 3 minutes. Midazolam 1.5 mg in divided doses was carefully administered over three minutes to control her restlessness in preparation for awake fiberoptic intubation. The goal was to begin with fiberoptic nasal intubation. However, the situation rapidly deteriorated with the patient exhibiting increased restlessness and agitation. The reason was a rapidly progressive enlargement of the hematoma with marked tracheal deviation. Awake fiberoptic intubation was abandoned due to increase in patient movement and lack of cooperation.

Considering the circumstance the decision was to made to proceed with an emergency intubation. Simultaneously the patient's stridorous breathing rapidly deteriorated to nearly complete airway obstruction. Because patient movement would further complicate direct laryngoscopy, intravenous propofol 150 mg was administered. Oxygen saturation was briefly maintained at 95 %. Facemask ventilation was impossible and direct laryngoscopy was attempted but laryngeal edema prevented visualization of any glottic structures. A blind attempt at inserting an endotracheal tube resulted in esophageal intubation. Next, the intercisor distance prevented insertion of a number 3 LMA. During this time the SpO₂ decreased to less than 60 %.

An esophageal Combitube (ETC) 37 F SA (1,2; Tyco-Healthcare-

Kendall, Mansfield, MA; www.combitube.org) was then inserted blindly. Ventilation was marginal and complicated by increased peak airway pressures. However, oxygenation saturation rapidly improved and could be maintained at 97 % with an FiO_2 of 1.0. General anesthesia was completed and the hematoma was evacuated. Following evacuation of the hematoma ventilation improved as peak airway pressures declined.

The Combitube was then replaced with a surgical tracheotomy. The ETC was removed after ventilation through the tracheotomy was confirmed. The patient was transferred to the intensive care unit where she remained for two days until the upper airway swelling had resolved. Then she was transferred to a ward. The tracheal stoma was closed seven days later and the patient was subsequently discharged from the hospital without sequelae.

DISCUSSION

While the laryngeal mask airway is an extremely useful device for securing the airways during general anesthesia, its design is not primarily conceived for emergency intubation. In contrast, the Combitube is intended primarily for securing the airways and for adequate ventilation under extreme circumstances (3). Therefore, the Combitube has gained increasing interest in the hospital communities worldwide (3-5). This case report shows that in certain cases the use of the Com-

bitube may save a patient's life when other means of securing the airway fail (4,5). The superiority of the Combitube in this case is due to its slim design thereby surpassing the laryngeal mask airway. The ETC should be considered as an additional tool for managing the patient's airways under difficult circumstances (6-8).

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REVIEW

The Bullard Laryngoscope as an Alternative in Difficult Airway Management. A Review.

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Partly presented as part of the lecture "Alternatives in difficult airway management", in the First "Oscar Loynaz R" Meeting on advances in Difficult Airway Management, 3/11/2001, Caracas, Venezuela.

ABSTRACT

Objective: The Bullard laryngoscope (BL) has been available for difficult airway management for more than a decade. It has been specially advocated for use in patients with cervical spine pathology or difficulty in mouth opening. The aim of the article is to review the characteristics of this instrument used in the management of the recognized or unrecognized difficult airway.

Data collection: Critical review of the literature, both printed and on-line, with special emphasis in the evolving intubating techniques.

Conclusions: Although the Bullard laryngoscope has been questioned as difficult to operate and expensive, it is a valuable alternative for the management of the difficult air-

way patient. In the subsets of patients with known or suspected cervical instability and mouth opening difficulties, it has been proven to be extremely helpful. Emphasis is made in reviewing the evolving intubating techniques that have been designed to ease the operation. The adult size Bullard laryngoscope has been reported for use both in the adult and the pediatric population. It has also been mentioned in awake intubations. It can be concluded that the Bullard laryngoscope is an important addition to any difficult airway cart. The ease of exposure of the glottic aperture, the avoidance of axis alignment, the large working channel and the rugged construction in contrast to the flexible fiberoptic bronchoscope are assets in favor of the Bullard.

Key Words: Bullard laryngoscope, intubation, intratracheal-instrumentation, laryngoscopy-instrumentation, difficult airway, cervical spine pathology, fiberoptics, Combitube

INTRODUCTION

The Bullard Laryngoscope (BL; Circon ACMI, Stamford, CT, USA) is a rigid fiberoptic laryngoscope for the indirect vision of the glottic aperture. It was designed by Roger Bullard, an obstetric anesthesiologist at the Medical College of Georgia. Due to its anatomical shape adapted to the conformation of the oropharynx it does not require the alignment of the oral, pharyngeal and laryngeal axis. With the use of either a dedicated or a multifunctional stylet, it can be used for endotracheal intubation. It can also be used with independent malleable stylets, lighted stylets or directional tip endotracheal tubes.

The BL has shown its usefulness in the management of patients with unstable posttraumatic cervical spine (1,2), non traumatic cervical spine pathology (3), maxillofacial trauma (4), morbid obesity and pregnancy (5) and limited oral opening (6). It has also been used as help in performing nasal intubation (7).

DESCRIPTION

The Bullard laryngoscope is a rigid blade with a curved, anatomical shape that comes in three different sizes; the pediatric, the pediatric long, and the adult size. The blade contains the three operative components of the instrument: the light bundle, the image bundle, and the working channel. The light source can be obtained either from a standard laryngoscope battery

handle (BH; non fiberoptic) or a cable connected to an external fiberoptic light source. When the BH is used, it would not engage or disengage from the body of the laryngoscope without pushing a safety lock located beneath the handle connector. The manufacturer provides adapters for several light guides available on the market. The eyepiece can be connected to most of the video cameras used for endoscopy or laparoscopy and has been recommended as an aid in teaching the intubating skills with the BL (8). Although the light provided by the external source is far superior than the one rendered by the battery handle, it limits the portability of the equipment, one of its best assets. The optics can be focused at eyepiece level, giving a clearer image for the different operators.

The instrument has a large working channel (3.7 mm/11F) that can be used to deliver topical anesthetics, to suction secretions or to establish an oxygen flow to help with oxygenation. As with any equipment that has this type of capability, care must be taken to ensure that barotrauma does not occur due to inadvertent blockage to the exit of exhale gases. There are several references in the literature about jet ventilation via the working channel (9-11). It has been used as an aid to laser surgery in the upper airway and also to allow extra time for intubation in resident teaching.

Although the working channel is large enough to allow the clearing of secretions from the field of view, these maneuvers can be troublesome since

Table 1. Characteristics of the Bullard Laryngoscope's different models.

Bullard Model	Tip size	blade width	Age Range
Adult	2.7 cm	2.5 cm	> 10 yrs
Pediatric Long	1.4 cm	1.6 cm	2–10 yrs
Pediatric	0.6 cm	1.3 cm	neonates–2 yrs

the secretions are attracted to the optics and can obscure the view instead of clearing it.

The three sizes differ in width and length of the blade, as can be seen in table 1. The adult size can be used even in small children, although the pediatric long is the appropriate size in the 2 to 10 year range. It is important to mention the possibility of usage of the adult size in most children, since this is an expensive alternative to have for the management of the difficult airway and the general anesthesiologist is just occasionally confronted with a child with a difficult airway.

As pointed out by Zadrobilek (12) and others, the adult size has been mentioned as not being long enough to lift the epiglottis in some adult patients. This problem prompted the manufacturer to offer a plastic blade extender that could be attached to the BL blade. Due to the enhanced easiness of glottic exposure and the protection of soft tissue given by the plastic extender, we now use it in all our patients. There have been reports of accidental dislodgement of the blade extender into two patient's pharynx so it is extremely important to insert the extender firmly over the blade till a click is both felt and heard. This new stylet is attached to the body of the laryngoscope with a fin-

ger screw (13). Although the blade extender can be removed from the laryngoscope with a very firm pull, it is easier to use a blade remover also provided by the manufacturer.

INTUBATING STYLETS

The BL is an excellent instrument for the exposure of the rima glottis. It has been shown that the view obtained with the BL is not related to the conventional laryngoscopic view. Intubation is equally easy in patients with a grade I or a grade III Cormak-Lehane score (14).

On the other side, the act of intubation itself can be somewhat difficult due to the handling of the ETT. Initially, the manufacturer provided an intubating forceps as a means for intubation. This forceps proved to be impractical and has been mostly abandoned. Subsequently, a dedicated intubating stylet (DIS) was devised and found out to be easier to use in clinical situations. The DIS is a preformed rigid non-malleable wire that is attached to the proximal aspect of the blade, in a connecting port located beside the working channel. It has a safety locking mechanism that has to be pressed in order to attach/remove the DIS to or from the BL. When the endotracheal tube (ETT) is loaded to the

DIS, it has to be placed underneath the blade. To confirm the proper positioning of the ETT/DIS complex, the angled distal tip of the stylet must be seen through the eye piece.

Recently, a multifunctional stylet has come to the market. This accessory is hollow and has an outer diameter (OD) of 5.6 mm and an inner diameter (ID) of 4.5 mm. It comes with an intubating catheter (4.2 mm OD, 81 cm in length). Although the procedure advocated for the multifunctional stylet involves more steps than the one used with the DIS, it is said to be easier, with a higher rate of success.

INTUBATION TECHNIQUES

The insertion of the Bullard laryngoscope is done in a semicircular fashion, mimicking the shape of an oral airway. The initial steps are common to all the accessories, so they will be reviewed first. When appropriate, a tip or special maneuver will be highlighted for the different intubating methods.

1. Instrument and patient are prepared as in any difficult airway case. It is important to stress that the techniques of difficult airway management should be learned in the intubating manikin followed by practice in patients with normal airway. The difficult airway patient is no place to learn a technique. It is a good idea to have a difficult airway cart that has as many alternatives as possible for the management of this situations, including an LMA, Combitube, fiberoptic bronchoscope (FOB), and lighted stylet.

2. The blade should be lightly lubricated in its lingual face. It should also be defogged either with a special defogging solution (provided) or a gauze soaked in a warm, soapy solution. The light source is checked before intubation.

3. The ETT is loaded onto the dedicated or multifunctional stylet that has been well lubricated, with the 15 mm connector removed. We have found that if the ETT has been warmed ahead of time in hot solution, it becomes more pliable, adapting better to the stylet. In the case of the DIS, the tip of the stylet is brought out through the Murphy eye. In the classical technique this is very important. The ETT should not be seen through the eyepiece when the DIS is mounted on the Bullard. Only the tip of the stylet should show itself because the direction of the stylet's tip is the direction towards which the ETT will slide. The operator has to remember that he will not be able to maneuver with the stylet since it becomes one piece with the blade. The head of the patient is placed in the neutral position. Should the patient be wearing neck collars or traction devices for cervical stabilization, they should be left in place.

4. The BL is then grabbed with the non-dominant hand at the level of the working channel, light source connection. The equipment should not be held by the battery handle because it is more difficult to manage. This hand should keep the ETT properly aligned at the dorsal aspect of the blade. Although the BL's profile is only 6 mm,

the blade/ETT complex could reach up to 2 cm (needed oral opening). It is important that the pilot inflating line of the ETT is kept free.

5. The operator positions himself at the patient's head. The patient is pre-oxygenated with 100% O₂ for five minutes. The device is then placed parallel to the body's axis, and the blade is inserted into the mouth with a semicircular movement that follows the anatomy of the oral cavity around the tongue. Care should be taken in not pushing the tongue posteriorly towards the pharynx. At the end of the 90° degree semicircle the laryngoscope is perpendicular to the patient's body.

6. After a slight drop of the blade so it would rest in the posterior wall of the pharynx, it is moved in a caudal direction, while the pharyngeal structures are identified. In our experience, a number of failures to intubate with the BL can be attributed to the blade not being long enough to pick up the epiglottis. That is why we suggest the need for the blade extender in all adult patients. This accessory could disengage in the mouth of patients as reported by Habibi and Marshall (15,16), therefore the careful placement and removal of the laryngoscope can not be stressed enough.

7. Once the glottis is identified, there are as many as seven different ways of passing the tube through the vocal cords:

- A. Bullard forceps
- B. Independent malleable stylet
- C. Standard dedicated rigid stylet

D. Multifunctional stylet with intubating catheter

E. Directional tip ETT (endotrol®; Tyco-Healthcare, Mansfield, MA) (7)

F. Guide wire and endotracheal tube exchanger

G. Small (4 mm) FOB through the multifunctional stylet to act as a guide for the ETT

TRICKS OF THE TRADE

Different authors have developed their own strategies to use the BL. Crosby (8) proposed to rectify the tip of the rigid DIS, changing the 45° degree angle to 15° degrees. He also suggests not to expose the stylet through the Murphy eye, leaving it completely inserted in the ETT. This maneuver would, in his opinion, direct the tube more centrally, avoiding the left vocal cord. We have found that having an aid moving the larynx towards the left, this aid centers the tube in the glottic opening and could ease the insertion of the endotracheal tube. In another study, Katoh et al. (17) compared different positions of the ETT over the rigid stylet in 108 patients and found that if they rotated the ETT 180° degrees placing the bevel towards the right without using the Murphy eye, the rate of success was 100%.

CLINICAL EXPERIENCE

The use of the Bullard laryngoscope has been reported in various instances of difficult airways, both in the

recognized and the unrecognized varieties. Its usefulness in the awake intubation of patients with topical anesthesia (5,18,19) gives the BL a place in the ASA algorithm for management of the recognized difficult airway. Cohn (18,19) describes the use of an oral airway liberally coated with 5% lidocaine gel, to topically anesthetize the tongue surface, in preparation for the Bullard blade insertion.

Both Watts and Hastings have found less cervical movement when comparing the Bullard Laryngoscope with the Macintosh (2) and Miller blades (20).

Although the Bullard has been presented as having a prolonged learning curve, Cooper (14) reported 50 cases intubated in less than 30 seconds and Cohn (19), in small number of patients, found faster intubating times with the Bullard as opposed to the FOB.

CONCLUSIONS

It can be concluded that the Bullard laryngoscope is an important addition to any difficult airway cart. The ease of exposure of the glottic aperture, the avoidance of axis alignment, the large working channel and the rugged construction in contrast to the flexible fiberoptic bronchoscope are assets in favor of the Bullard.

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MEETING REPORT

Review of the Anesthesia Meeting "Dr. Oscar Loynaz R. Advances in Difficult Airway Management"

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ABSTRACT

Objective: The management of the difficult airway is a vital task for the anesthesiologist. Any given patient can, at the induction of anesthesia or during the case, develop ventilation and oxygenation problems that will place him/her in jeopardy. Continuous education in the management of the difficult airway is something that needs to be pursued, due to the relative unavailability of certain techniques, due to cost of the equipment, or due to the lack of familiarity with novel procedures.

Aim of the Congress: The Anesthesia Meeting "Dr. Oscar Loynaz R. Advances Difficult Airway Management" tried to cover as many as possible of the relevant topics in this area.

Key Words: Anesthesia Meeting, difficult airway, new methods, anesthesia management

The meeting was specially targeted towards the anesthesia trainees who sometimes lack the possibility to practice with sophisticated equipment due to the characteristics of developing countries.

Conclusion: The Department of Anesthesia of the Instituto de Clínicas y Urología Tamanaco (ICUT), offered a well organized meeting and hands-on- workshop for the management of difficult airway management. It had a large attendance and fulfilled the expectations of both organizers and public. The general opinion and request was to continue with this type of scientific but clinically relevant gatherings that are urgently needed in the Venezuelan anesthesia community.

MEETING REPORT

Name of Meeting: First Meeting of Advances in Anesthesia "Dr. Oscar Loynaz R. Advances in Difficult Air-

way Management".

Date: November 3rd, 2001.

Location: "Tamanaco" Intercontinental Hotel, Caracas, Venezuela.

Sponsored by: Department of Anes-

thesia. Instituto de Clínicas y Urología "Tamanaco" (ICUT)

Organizing Committee: Dr. Carlos Loynaz R., Head of Department, Dr. Xavier Márquez F. Scientific Coordinator, and Dr. Julieta Arroyo E. General Coordinator.

ICUT Faculty:

Dr. Juan Carlos Arroyo MD

Dr. Juan Carlos Carnevali MD

Dr. Xavier Márquez MD

National Guest:

Dr. Arcelia Valero MD. JM de Los Ríos Children's Hospital, Caracas, Venezuela.

International Guests:

Dr. John Doyle MD. Toronto Hospital. University of Toronto, Toronto, Canada.

Dr. Tony Sanchez MD. K.P. Baldwin Park Medical Center / University of California Irvine, Irvine, California, USA.

Layout: Eight thirty minute Conferences and two one and a half hours, sessions of hands-on workshop, in a one day format.

Conferences: Evaluation of the Airway/ASA Algorithm: Dr Arroyo reviewed both the different tests used today to recognize the difficult airway and the way the ASA algorithm should be applied. The shortcomings of tests like Mallampati, thyromental distance, sternomental distance as predictors of difficult airway when used alone were mentioned. Dr. Arroyo highlighted the importance of combining tests to increase the prediction of difficult airway.

1. LMA: Dr. Doyle did a quite thorough review of the classical LMA.

He addressed the development, indications, contraindications and complications of this wonderful device, one of true significant changes in airway management. He reviewed the literature also sharing his extensive clinical experience using the LMA.

2. Trauma and the Difficult Airway: Dr. Carnevali offered an excellent conference. He showed a number of striking trauma pictures and related them to the different strategies in the management of the traumatized airway. The talk was very well received by the audience.

3. The Pediatric Difficult Airway: in this conference, Dr. Valero, Head of the Department at Venezuela's largest Children Hospital, explored the differences between pediatric and adult airways. She then proceeded to mention some congenital anomalies of the facial structures (Pierre-Robin, Goldenhar syndromes), explaining the airway management experience at her hospital. The large departmental experience in retrograde intubation in children was shown.

4. Alternatives in Difficult Airway management: Dr Márquez rendered a talk that comprised quite a few of the devices used in the modern management of the difficult airway. He covered the Combitube, the Laryngeal Tube (LT), the Airway Management Device (AMD), the Bullard Laryngoscope, the Lighted Stylet, the Frova stylet, and the buggie (Eshmann introducer) among others.

5. Disasters in Difficult Airway Management: In this very well liked

talk, Dr. Doyle shared with his Venezuelan colleagues different cases that had challenged the anesthesia team at his hospital. He recommends to learn from mistakes and to gather experience with everyday practice.

6. **Fiberoptic Aided Intubation:** In the afternoon session, Dr. Sanchez, in his inimitable way, really got the audience's attention about the topic of fiber optically aided endotracheal intubation. He covered all the aspects of this gold standard of difficult airway management. Pitfalls, complications and unusual variations of the classical technique of FOB intubation were mentioned.

7. **Cricothyrotomy:** Dr. Sanchez, a world renowned surgical airway expert, went on with the last lecture of the afternoon, about cricothyrotomy. He excelled in his explanations in a very clear and practical manner. This was most important, since it is life saving technique and one that is not sufficiently practiced by most of the anesthesiologists. He stressed the importance of gathering experience with mannequins in this and other surgical airway methods like retrograde intubation and TTJV.

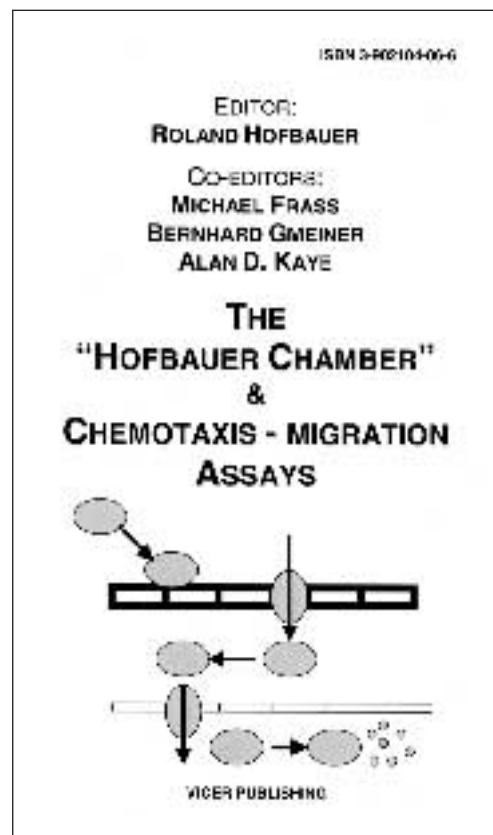
Attendance: Two hundred twenty seven anesthesiologists, anesthesia trainees, emergency physicians and ICU specialists, both doctors and nurses, attended the meeting.

Hands-on workshops: The only complain of the participants was the limited capacity of the workshops. One hundred of them had the opportunity of chatting with the experts, practicing

the different techniques and clearing doubts while presenting their personal experiences. There were seven stations covering LMA (including Fast-Trach and Proseal), FOB, Cricothyrotomy, Bullard, Combitube, Lighted Stylet, and Laryngeal Tube.

Comments: According to the public's opinion, the meeting was very well organized. It covered relevant topics for every day use of both the general anesthesiologist and the one with special difficult airway interests. Through the efforts of ICUT's Anesthesia Department, the meeting was presented free of charge to the Venezuelan anesthesia community. The meeting tried to convey the presence of residents in anesthesia and anesthesiologists from outside the capital city Caracas, in an effort to reach as many anesthesia specialists as possible, giving them the tools to successfully manage the difficult airway. Attendants made comments about the need of Question/Answer sessions and more space availability in the workshops.





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