

A novel approach to manage patients with compromised airway

Videoscopic assisted retromolar intubation

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ABSTRACT

تعتبر الأدوات المساعدة للتعامل مع المرضى الذين يعانون من إنسداد مجرى الهواء ضرورية من أجل ممارسة آمنة للتخدير خاصة لدى المرضى المعرضين للمخاطر العالية. تم وصف مجموعة من الحالات باستخدام طريقة جديدة للاستخدام المشترك والمتكامل لأدوات تثبيت أنبوبة إلى القصبة الهوائية (التثبيت خلف الرحي بمساعدة منظار حنجرة مزود بفيديو) لتعزيز مجرى الهواء في مجموعة فرعية من المرضى المعرضين للمخاطر العالية والذين يعانون من صعوبة بالغة في دخول الهواء. كما يتناول تقرير الحالة تبريرا للجمع بين هاتين الأدوات فضلا عن مزايا وعميوب هذه التقنية. ولقد أسفر استخدام هذه الطريقة في المرضى الأربعة إلى نجاح تثبيت الأنبوبة الهوائية دون الحاجة للعمليات الجراحية في مجرى الهواء. وقد أظهرت هذه التقنية العديد من المزايا والتي تجعل من الممكن استخدامها في التعامل مع كثير من الحالات صعوبة دخول الهواء للمجاري التنفسية والتي تهدد حياة المريض.

Aids to difficult airway management are essential for safe practice of anesthesia particularly for high-risk patients. This case series described a novel approach of combined use of complementing tools (videolaryngeoscopic assisted retromolar intubation) to enhance airway management of a subset of various high-risk patients with extremely difficult airway. It also addressed the rational for the combination of such approaches as well as the advantages and disadvantages of this technique. In all of the 4 patients, the use of the combined approach resulted in a successful intubation without the need for surgical airway. This technique showed many advantages making it possible to use in cases with life threatening airway obstruction.

Saudi Med J 2013; Vol. 34 (3): 308-312

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Received 5th December 2012. Accepted 30th January 2013.

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Aids to difficult airway management are essential for safe practice of anesthesia particularly for high-risk patients. Peterson et al¹ defined difficult airway as “the clinical situation in which a conventionally trained anesthesiologist experiences difficulty with face mask ventilation of the upper airway, difficulty with tracheal intubation, or the difficult airway is a complex interaction among both”.¹ Difficult airway is a feared anesthetic scenario because if handled poorly, hypoxic brain injury or death may result.² Fortunately, the introduction of modern respiratory monitoring in the mid-1980s and adoption of new standards of care for patient monitoring as well as practice guidelines for management of the difficult air way in 1993, resulted in significant decline in death and brain damage.³ Some factors related to medical legal issues, publications bias for negative results could be linked to less full reporting of all adverse outcomes related to under management of cases with difficult airway. Hence, new airway management techniques aiming to improve the management of such complex cases and complicated situations are still needed. This series described a novel approach of combined use of complementing tools (video-laryngeoscopic assisted retromolar scope) to enhance airway management of subset of various high-risk patients with extremely difficult airway. In all of the 4 patients, the use of the combined approach had resulted in a successful non-invasive intubation without the need for surgical airway. The series also addressed the rational for the combination of such approaches as well as the advantages and disadvantages of this technique.

The technique. To set up for the technique, you should have hard suction tip, for the first assistance, videoscopic laryngoscopic (Karl Storz/Germany) with light source and screen monitor, retromolar scope (Karl Storz/Germany) loaded with appropriate size endotracheal tube partially covering the tip, a separate light source, and the viewing monitor is connected to the scope, and 4 L oxygen for insufflation is connected

to side of the endo tracheal tube (ETT) holder of the retromolar scope for apneic oxygenation, clearing of airway secretions and blood, and to protect lens from blocking by secretions and/or blood in the airway. A complete simulated set up is seen in **Figure 1**.

Step-by-step application of the technique. All equipments are prepared and checked for focus and orientation. Initial video-laryngoscopy is carried out with the left hand, with airway suctioning by the main operator with the right hand. The suction tip is handed to the first assistant to be kept it ready in the right side of the mouth and down to the oropharynx. At this stage, oxygen is being insufflated at 4-6 L/min through the retromolar scope tube holder. Using the right hand, the main operator introduces the retromolar scope in a sagittal orientation to patient body to visualize the first landmark, the uvula. The retromolar scope handle is then rotated to operator view and identify laryngeal anatomy, using oxygen to flush secretion, with the right hand. The operator then manipulates the videolaryngoscope and the retromolar scope with both hands get best possible view of the airway with ongoing suction by the first assistant if needed. Once the vocal cords are identified, intubation follows with passage of retromolar scope to the upper segment of the trachea. Once the tube is in position, the operator had to pull out the videoscope laryngoscope in the left hand. The operator left hand holds the ETT at the patient mouth. The tube is freed from ETT holder in the retromolar scope by the first assistance. The retromolar scope was pulled interiorly toward the patient chest, along its anterior curvature, keeping the ETT, in place in the patient airway. The cuff of ETT is inflated and confirmation with EtCO₂ and chest auscultation and subsequently by chest x-ray to confirm distance from the carina.

Case Report. Patient One. Fifty-two year old obese (weight 85 kg, height 1.6 meter, and body mass index 33.2) male patient diagnosed with portal hypertension due to cirrhotic liver disease. He developed complete airway obstruction during esophageal varices injection and ligation under conscious sedation (Fentanyl 150 microgram and Midazolam 2 mg) in the intensive care unit. Both initial intubation using laryngoscopy and later fast-track intubation through laryngeal mask airway (LMA) had failed repeatedly and resulted in massive upper airway bleeding due to rupture of pre-existing high esophageal varices. Surgical tracheostomy was attempted, but failed (**Figure 2**) due to patient short neck, deep trachea, and extensive bleeding from dilated collateral varicose veins. The patient was then intubated by the

described combined non-invasive technique, and the tracheostomy site was stitched by the surgical team. The ligation procedure was then completed and chest x-ray was carried out to confirm tube position.

Patient 2. Sixty-two year old male patient was accidentally extubated in the post-cardiac surgical intensive care unit, one-day post coronary artery bypass graft (CABG). Ventilation was adequately initiated. Ventilation started to become increasingly difficult and patient saturation declined to 90% on 100% facemask ventilation. Three attempts for intubation with laryngoscopy failed to visualize any portion of the larynx. The patient was intubated using the combined videoscopic assisted retromolar approach, despite significant bleeding from the upper airway due to previous failed intubation attempts (**Figure 3**).

Patient 3. Thirty-two year old female, G1P0 (gravid 1, para 0), had an advance maxillary sinus



Figure 1 - A complete simulated setup of the used technique.



Figure 2 - Fifty-two year old male patient presented with massive upper airway bleeding from esophageal varices with past history of cirrhotic liver and portal hypertension.



Figure 3 - Sixty-two year old male patient after cardiac surgery showing significant bleeding from the previous attempt of intubation.



Figure 4 - Thirty-two year old pregnant, female (34 weeks), booked for emergent cesarean section. She had an advanced maxillary sinus carcinoma and underwent debulking one year ago. She presented with extensive airway bleeding due to the presence of the tumors necrotic edge.

carcinoma and lost to follow up after initial debulking surgery, one year ago. She was presented to the hospital emergency room at 34 week of gestation in semi-conscious status, with comprised fetal beat-to-beat variability, and was booked for emergency cesarean section. She was not considered for regional neuroaxial anesthesia due to intracranial extension of the tumor, which was invading the left orbit. She was prepared for awake fiber optic intubation. She received Glycopylorate 0.6 mg IV for drying of secretions followed by Midazolam 1 mg, intravenously for amnesia, and then Fentanyl 50 microgram was administered just before intubation. A total of 15 ml of Xylocain 2% was used for topically using mouth gurgling (10 ml) and injection through the fiberoptic scope (5ml). The procedure was aborted because of bleeding in the airway, which made the fiberoptic intubation difficult, and the patient lack of cooperation due to language barrier. General anesthesia was induced after pre-oxygenation and intravenous administration of propofol 120 mg, suxamethonium 100 mg. The patient was intubated using the combined technique from the first attempt and then cesarean section was carried out, and a baby boy was delivered with Apgar scores 9, 10 at 1 and 5 minutes respectively (Figure 4).

Patient 4. Sixty-five year old achondroplastic dwarf lady, presented to the emergency room with history of dyspnea due to acute pneumonia on top of pre-existing restrictive pulmonary lung disease. She was on home oxygen therapy over the last 3 years. She had 2 failed trials of non-invasive ventilation due to mal-fitting of the facemask and lack of cooperation.



Figure 5 - Achondroplastic dwarf female age 65 years. She had 2 failed trials of non-invasive ventilation due to mal fitting of the face mask (lack of cooperation).

The patient was planned to be intubated by the managing emergency consultant for positive pressure ventilation, but this could not be achieved after 4 failed attempts of classic laryngoscopy approach due to extremely high larynx and short neck. This resulted in excessive airway bleeding. She was successfully intubated using the technique described earlier, and had been transferred to the intensive care unit for further management of her respiratory failure (Figure 5).

Discussion. Thong and Lim⁴ said that the newer recommended intubating devices such as

videolaryngoscopes, optic laryngoscopes, and fiberoptic intubating stylets, would considerably broaden the options of techniques for intubation of the difficult airway. Thong and Wong² stated that the Bonfils retromolar intubation fiberscope is an effective tool for difficult intubation since mastery is achieved. It is robust, portable, and reliable. Its versatility allows its use in difficult situations such as unstable cervical spines, airway tumors, and awake intubations. This case series described the combined use of videolaryngoscope and retromolar scope approach to non-invasively intubate bleeding difficult airway, as the 4 cases presented with a significant difficult situations that was not amenable to other classical management of difficult airway algorithm. All these cases were handled by senior staff, with more than 10 years experience, at all locations.

The described technique has many advantages. First, the main operator can use more than one tool at the same time to obtain a better view of the laryngeal structure. Second, given no limitation in the patient mouth opening, the use of multiple equipment can fit in normal sized oral cavity and oropharynx. Third, the use of screen monitors with high quality light improves visualization of the airway with magnification up to 40 times. There are also other assistant and observers to interpret images, structures, and also injuries, providing instant chances for better visualization. Forth, the ability to insufflate oxygen in the field has many advantages, namely providing apneic oxygenation, flushing of secretions and blood, and protecting against soiling of the retromolar lens by ongoing bleeding. Fifth, an added advantage related to the use of retromolar scope is a versatile design that allows it to be portable. Using a battery as the light source and an eyepiece for viewing (rather than a separate screen), it will easily be transported and used in various sites and during emergency situations as described. Sixth, this technique is future step to use advance technique for non-invasive airway intubation; thus, mitigate use of surgical airway. In all described cases, the used combination of a videolaryngoscope, a suction device and a Bonfils instrument is superior to the use of a videolaryngoscope, a suction device and a conventional tube. This could be attributed to the Bonfils ability to provide a clear view from the tip of scope view inside the endotracheal tube and the provision of oxygen flush that clears away secretions in these situations. All of these patients had failed intubation trials before using the described technique. In almost all cases, the main initial problem was inability to visualize the cords

(Grade III & IV Laryngeal view) due to large epiglottis secondary to patient's anatomy and/or to subsequent progressive airway edema and bleeding from previous failed intubation attempts. Though this technique is useful to manage such complex and complicated airway cases, it has some disadvantages. First, it is needed to have sophisticated equipment that are expensive to be acquired and need high maintenance and added increase in the costs of health care. Second, unavailability of such set up in many practice locations. Third, high level of cooperation and experience is needed to master the procedure. Forth, might not be readily available. Many of these disadvantages can be overcome using specific suggested solutions. Initially, adapting a dedicated difficult airway cart concept is important. Having a complete set up in a mobile trolley help to reduce high total capital costs of acquisition of such expensive tools and make it then available for use in any locations of the health care facility. Such cart was used in the medical ICU (in the first case), post-cardiac surgical ICU (second case), labor and delivery ward (third case), and emergency room (fourth case). Then, conduct team training exercise for difficult airway management cases. This can be carried out during routine cases in operation room or simulated scenarios in a designated health care simulation facility. Manikins and simulators had been used in many studies to investigate the performance using different devices such as Macintosh, Bonfils, Glideocope and C-trach LMA in normal and difficult airways, after training by oral instructions and demonstration of the intubation technique.⁶ On the other hand, other researchers considered manikin studies might not correlate with clinical performance when evaluating intubation devices. They believed that the use of rigid plastics, lack of collapsible soft tissues, absence of secretions, and sometimes incorrect epiglottis and laryngeal structures make the manikin unlikely to be useful surrogates for difficult airways when evaluating ease of intubation.⁷ Next, is to have a low level of threshold to activated difficult airway management team exercise. Such strategy helps orient a larger number of assistances on various uses of these tools, their availability and sharpen their abilities and subsequently enhances team readiness to manage more complex situations should such cases occur at emergency times.

In conclusion, this case series demonstrated the use of a novel combination of videolaryngoscopy and retromolar intubation with continuous oxygen insufflation to manage complex difficult airway cases

in various settings. Advantages of the technique and ways to overcome its possible disadvantages are also discussed.

In summary, this technique has many advantages to make it possible to use in many cases with life threatening airway compromise.

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Illustrations, Figures, Photographs

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