Airway Management of the Cardiac Surgical Patients: Current Perspective

Abstract

The difficult airway (DA) is a common problem encountered in patients undergoing cardiac surgery. However, the challenge is not only just establishment of airway but also maintaining a definitive airway for the safe conduct of cardiopulmonary bypass from initiation to weaning after surgical correction or palliation, de-airing of cardiac chambers. This review describes the management of the DA in a cardiac theater environment. The primary aims are recognition of DA both anatomical and physiological, necessary preparations for (and management of) difficult intubation and extubation. All patients undergoing cardiac surgery should initially be considered as having potentially DA as many of them have poor physiologic reserve. Making the cardiac surgical theater environment conducive to DA management is as essential as it is to deal with low cardiac output syndrome or acute heart failure. Tube obstruction and/or displacement should be suspected in case of a new onset ventilation problem, especially in the recovery unit. Cardiac anesthesiologists are often challenged with DA while inducing general endotracheal anesthesia. They ought to be familiar with the DA algorithms and possess skill for using the latest airway adjuncts.

Keywords: *Airway, airway assessment, cardiovascular collapse, difficult airway, fiberoptic, intubation technique, laryngeal mask, surgical airway*

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Introduction

The efficient management of airway, especially during induction of anesthesia, is an anesthesiologists' "holy grail." Difficult airway (DA) and intubation are encountered quite often in the practice of cardiac anesthesia. This may be partly attributed to the anthropometric or demographic profile of the patients with cardiovascular diseases. Congenital cardiac lesions are often part of a syndrome, which renders airway management all the more difficult in view of abnormal facial and/or oropharyngeal anatomy. Furthermore, procedures performed as cardiovascular emergencies rarely allow enough time for a thorough airway assessment. Therefore, not surprisingly, most of the difficult laryngoscopy and intubation cases encountered in the cardiac theaters are unanticipated. Unanticipated DA (UDA) is ubiquitous in cardiac surgical cohort vis-à-vis general surgery population in other parts of the world as well.[1]

It is known that most elective cardiac surgical patients are either NYHA II or III and they are at least American Society of Anesthesiologists (ASA) Physical Status 3 when they present for surgical interventions. Thus, the administration of anesthesia for this subset demands an absolutely steady haemodynamics during induction of general endotracheal anesthesia. Any hemodynamic perturbation during this phase of presurgery medical management by the anesthesiologist is very poorly tolerated. This requires a great deal of experience, training, and understanding of individual cardiac lesions and their response to various anesthetic drug regime and interventions. Many of these patients also have fixed cardiac output (CO) and their compensatory mechanisms are not fully functional. Therefore, any increase or decrease in systemic vascular resistance (SVR) and heart rate, which occurs during laryngoscopy and tracheal intubation due to sympathetic activation, can adversely affect the hemodynamics. Thus, the duration and number of such activities should be restricted to the minimum during anesthesia management. Considering the practicalities in managing airway in a cardiac patient, the importance of a strategic management plan cannot be overemphasized. Moreover, UDA is here

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to stay no matter how robust is our airway assessment scheme.[2]

The Physiologic Difficult Airway

The cardiopulmonary interactions resulting from the underlying pathophysiology pose additional challenges for safe airway management. Patients with poor cardiopulmonary reserve have the potential to desaturate during induction. This can be attributed to insufficient apnea time in this subset of patients as opposed to normal healthy individuals. Thus, it is important to ensure an adequate preoxygenation in these patients before obtunding their respiratory efforts. The current guidelines for DA management by ASA recognize this problem and recommends the use of supplemental oxygenation (para-oxygenation) during airway procedures.[3] While the anatomic DA is one in which obtaining a good glottic view or passing an endotracheal tube (ETT) is challenging, the physiologic DA is one where physiological derangements subject the patient to a higher risk of cardiovascular collapse with intubation and positive pressure ventilation (IPPV). These physiologic abnormalities should be taken into consideration while planning for intubation even if no anatomic airway difficulty is anticipated. Congenital cardiac and valvular lesions with increased pulmonary blood flow and consequent pulmonary arterial hypertension, right ventricular dysfunction/failure leading to preexisting ventilation-perfusion (V/Q) mismatch present physiologic hindrances to ventilation. It is not rare to encounter a combined anatomical and physiological difficulty, and any mismanagement of the airway is poorly tolerated and can even be fatal. The preexisting risk gets exaggerated when intubation requires multiple attempts with difficult intubation being an independent predictor of death. Essentially, there are four physiologic difficulties encountered while securing airway before mechanical ventilation. This section highlights the airway management strategies based on the available evidence and experience to reduce the risk of CV collapse when challenged with one of the following high-risk scenarios.

Hypoxemia

Preoxygenation and apneic oxygenation should be performed in all patients with "sick" hearts. The latter is a low-cost, low-risk intervention that may be beneficial in prolonging the safe apnea period. Transnasal humidified rapid insufflation ventilatory exchange has recently been shown to increase apnea time by delivering O_2 through nasal cannula at 70 L/min. This facilitates CO_2 washout by gaseous mixing and flushing of dead space.[4] In patients with shunt physiology due to atelectasis or pulmonary edema, noninvasive positive pressure ventilation (NIPPV) can improve alveolar recruitment and oxygenation. Nasal mask delivering continuous positive airway pressure may be useful to maintain alveolar recruitment during intubation of high-risk patients.

Hypotension

Peri-intubation hypotension is common in critically ill patients, and roughly a quarter of patients develop transient hypotension after IPPV.[5] Peri-intubation hypotension is a major risk factor for adverse events such as cardiac arrest, longer Intensive Care Unit (ICU) stay, and increased mortality.[6] Fluid resuscitation is important in volume responders (volume responsiveness is typically defined as an increase in CO >15% in response to a fluid challenge). Hemodynamically stable induction agents such as etomidate and ketamine should be used before intubation whenever possible. For patients unresponsive to fluid resuscitation, a norepinephrine infusion should be started. Hence, peri-induction fluid resuscitation and rational pharmacologic intervention will optimize hemodynamic stability with successful airway management in a hypotensive patient. Typically, a "Tet-spell" in a tetralogy of Fallot case during induction/intubation can be managed with manual compression of abdominal aorta. This helps by reversing the right-to-left shunt across the ventricular septal defect. In some cases, aliquots of norepinephrine (10–20 mcg) help in increasing the SVR, thereby decreasing the right-to-left shunt diverting more blood to the pulmonary circulation for oxygenation.

Severe acidosis

In patients with respiratory acidosis, a rapid correction can be achieved by increasing alveolar ventilation. Doubling the minute ventilation (MV) will roughly reduce the $PaCO_2$ by half. Thus, respiratory acidosis is usually corrected effectively by interventions that increase the alveolar ventilation such as NIPPV, bag-valve-mask ventilation (MV), and IPPV/mechanical ventilation. In severe metabolic acidosis due to diabetic ketoacidosis and lactic acidosis, the tissue level acid productions demand an alveolar MV that cannot be met with conventional mechanical ventilator and patient can develop profound acidemia. Patient with extremely high MV requirements may develop relative hypoventilation, flow starvation, patient-ventilator dyssynchrony, and further worsening of acidosis. In such situations, intubation should be delayed till underlying metabolic acidosis is corrected using short trial of NIPPV so as to maintain spontaneous respiratory effort in turn allowing the patient to maintain their own high MV. Alternatively, if intubation cannot be avoided, a short-acting neuromuscular blocking agent (e.g., succinylcholine, mivacurium) can be used for a quick return of spontaneous respiration. It is recommended to use pressure support ventilation so that patient will have autonomy to set the rate and tidal volume delivered by the ventilator. Special care should be taken to monitor air trapping (due to high respiratory rate and high flows) and respiratory muscle fatigue that can lead to further respiratory decompensation.

Right ventricular failure

Normally, right ventricle (RV) is a low-pressure, high compliance chamber geared to channelize venous blood returning to the heart into the pulmonary circulation. Any process that increases the RV afterload such as primary pulmonary hypertension, pulmonary arterial hypertension, or pulmonary embolism increases RV wall tension, which adapts by increasing muscle mass and/or contractility. It is critical to determine if the patient has RV dysfunction (where the RV has some contractile reserve) or acute decompensated (overt) RV failure where RV is unable to meet increased demands leading to RV dilation, retrograde flow (marked by hepatomegaly, anasarca) decreased coronary perfusion, leading to left ventricular dysfunction, systemic hypotension, and cardiovascular collapse. The cardiopulmonary interactions play a major role in RV dysfunction so much so that any increase in intrathoracic pressure (ITP) with IPPV decreases RV preload causing further decompensation making endotracheal intubation (ETI) extremely risky. Unlike left ventricle function, which improves with IPPV, RV function worsens with the increase in ITP induced by IPPV. Bedside echocardiographic assessment of RV function can help identify RV dysfunction in which some contractile reserve may help improve the hemodynamics after careful volume expansion. Preoxygenation is useful despite reversal of intracardiac shunt producing hypotension and V/Q mismatch, which commonly occurs in RV failure.[7] Inhaled nitric oxide (iNO) at low concentration (<30 ppm) delivered continuously through the nasal cannula can enhance oxygenation by improving V/Q matching. In RV failure without hypoxemia, iNO at high concentration (30–80 ppm) through nasal cannula or inhaled epoprostenol during preoxygenation can help by reducing pulmonary vascular resistance. Induction agent (preferably etomidate) should be carefully chosen and slow intravenous (IV) fentanyl premedication may be useful to blunt the hypertensive response to laryngoscopy. The goals of mechanical ventilation in RV failure should be the maintenance of low mean airway pressure and avoidance of hypoxemia, atelectasis, and hypercapnia, which definitely increase RV afterload.

Management of the Recognized Anatomic Difficult Airway

Anesthesiologists generally do a thorough airway examination and assessment to formulate a plan for airway management (bag MV, laryngoscopy, and ETI) depending on the difficulty anticipated. Despite a number of tests for assessment of airway, difficulty may remain undetected, or in some cases, an easy airway may deteriorate into a DA.

The ASA practice guidelines for DA management define DA as a clinical situation, in which a conventionally trained anesthesiologist experiences difficulty with face MV of the upper airway, difficulty with tracheal intubation or both.[8] Since the introduction of the definition, a number of newer supraglottic airway devices (SGADs) have been used in anesthesia practice. Hence, any patient with an anticipated difficulty in MV, supraglottic device ventilation, conventional laryngoscopy (CL), or ETI, one can confidently classify the situation as DA. One needs to take appropriate history, do physical examination, and use specific tests to identify DA. During preoperative visit, one needs to ascertain the following.

Difficulty in bag and mask ventilation

A rapid assessment of difficult bag and mask ventilation can be done using beard, obesity/obstruction, no teeth, elderly, and snoring and mask seal. The presence of obesity/obstruction/age more than 55 years, absence of teeth and stiff joints.

Difficult laryngoscopy and intubation

It is declared when conventionally trained anesthesiologists are not able to visualize any portion of the vocal cords after multiple (usually 3) attempts at CL (Cormack and Lehane Grade 3 or 4).[9] The commonly used tests are summarized in Table 1.

Difficulties for supraglottic airway devices

A number of SGADs are available nowadays, and they may also act as a conduit for intubation. In some conditions, it may be difficult to place SGADs. Restricted mouth opening, obstruction in upper airway, disrupted upper

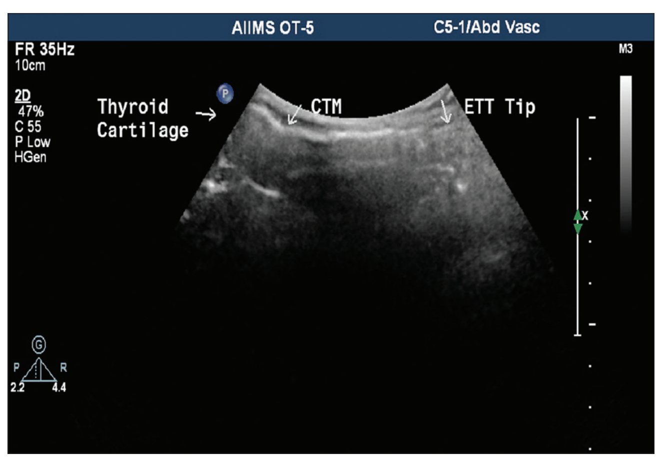


Figure 1: Midline long-axis ultrasonogram of the lower airway (extrathoracic) depicting the cricothyroid membrane (vertical arrow)

airway, for example, trauma, intraoral burns following caustic ingestion, stiff lung can help in quickly identifying such patients.

Difficult front of neck access

Front of neck (FON) is an important rescue area for securing the airway in case of cannot intubate

Figure 2: (a) A customizable difficult airway cart with contents of a drawer; (b) cart with fiberoptic bronchoscope cradle and video display unit attached to the cart

Figure 3: Various supraglottic airway devices in evolution (a) Classic laryngeal mask airway (1st generation), (b) Proseal laryngeal mask airway (2nd generation), (c) iGel and (d) Baska airway (3rd generation)

Table 1: Common airway assessment parameters and their implication

Test	Difficulty in managing
Teeth	Difficult insertion of laryngoscope
Length of upper incisor	
Absent or loose incisor	
Ability to protrude mandibular teeth anterior to maxillary teeth (upper lip bite test)[10]	Determines subluxation of thyromental joint and important for laryngoscopy. Inability to do so (Class III) indicates difficult laryngoscopy and intubation
Class I: Lower incisors can bite the upper lip above the vermilion line	
Class II: Lower incisors can bite the upper lip below the vermilion line	
Class III: Lower incisors cannot bite the upper lip	
Interincisor distance (mouth opening)	Preferably >3 cm minimum mouth opening should be at least more than the flange of the laryngoscope blade or LMA thickness for successful management
Mallampati classification (sitting position, maximum mouth opening, and protrusion of the tongue)	Assesses oropharyngeal space and a class more than III indicates difficult intubation
Class I: Soft palate, fauces, uvula, and pillars seen	
Class II: Soft palate, fauces, and uvula seen	
Class III: Soft palate and base of uvula seen	
Class IV: Soft palate not visible	
Palate anatomy	No cleft (laryngoscope blade may enter the cleft)/narrowing or high arching (less space to insert or laryngoscope blade)
Thyromandibular distance	At least 6 cm for tongue to fit into mandibular space. A lower distance may make larynx anterior and difficulty expected
Submandibular compliance	Decreased compliance makes laryngoscope manipulation difficult
Length of neck (the distance from the suprasternal notch to the mentum, measured with the head fully extended on the neck with the mouth closed)[11]	Short neck (<12 cm) reduces the ability to align airway axes
Neck thickness (at the level of the thyroid cartilage)[12]	Increased neck circumference may indicate difficult intubation
Neck movements (required to alignment of oral, pharyngeal axis for intubation) can be measured using a goniometer or a rough visual estimate[13]	A range of neck movement (including both flexion and extension) <80° may make intubation difficult

Figure 4: Various video laryngoscopes in use today easing many difficult airway management

Table 2: Suggested content of an ideal difficult airway cart

DA cart contents
Face mask - all sizes
Airways - different sizes
SGADs (e.g., LMAs - all sizes, ILMA of assorted sizes)
Laryngoscope (at least two sets) including video laryngoscopes [Figure 3]
Magill's forceps (two sizes)
Suction catheters (all sizes)
Bougies or intubating stylets
ETTs (all sizes)
ILMAs
Flexible fiberoptic laryngoscope
Tracheostomy kit (e.g., Ciaglia Rhino PCT kit) (equipment suitable for emergency)
Retrograde intubation equipment (invasive airway access)
Basic medications and LAs
ETTs securing tapes
Exhaled CO_2 ($EtCO_2$) detection devices
Tube exchangers with O_2 insufflation facility

PCT: Percutaneous tracheostomy, ILMAs: Intubating laryngeal mask airways, LMA: Laryngeal mask airway, LA: Local anesthetic, SGAD: Supraglottic airway devices, DA: Difficult airway, ETT: Endotracheal tube

cannot oxygenate (CICO) scenario. The FON area should be examined for any scarring, deformity, any growth, or vascular abnormalities. Furthermore, the patient cooperation and bleeding tendency should be documented. In patients with anticipated DA, the cricothyroid membrane can be identified beforehand with the help of ultrasound and marked so that airway can be quickly established in a CICO scenario [Figure 1].

In situations of anticipated DA, one should ensure:

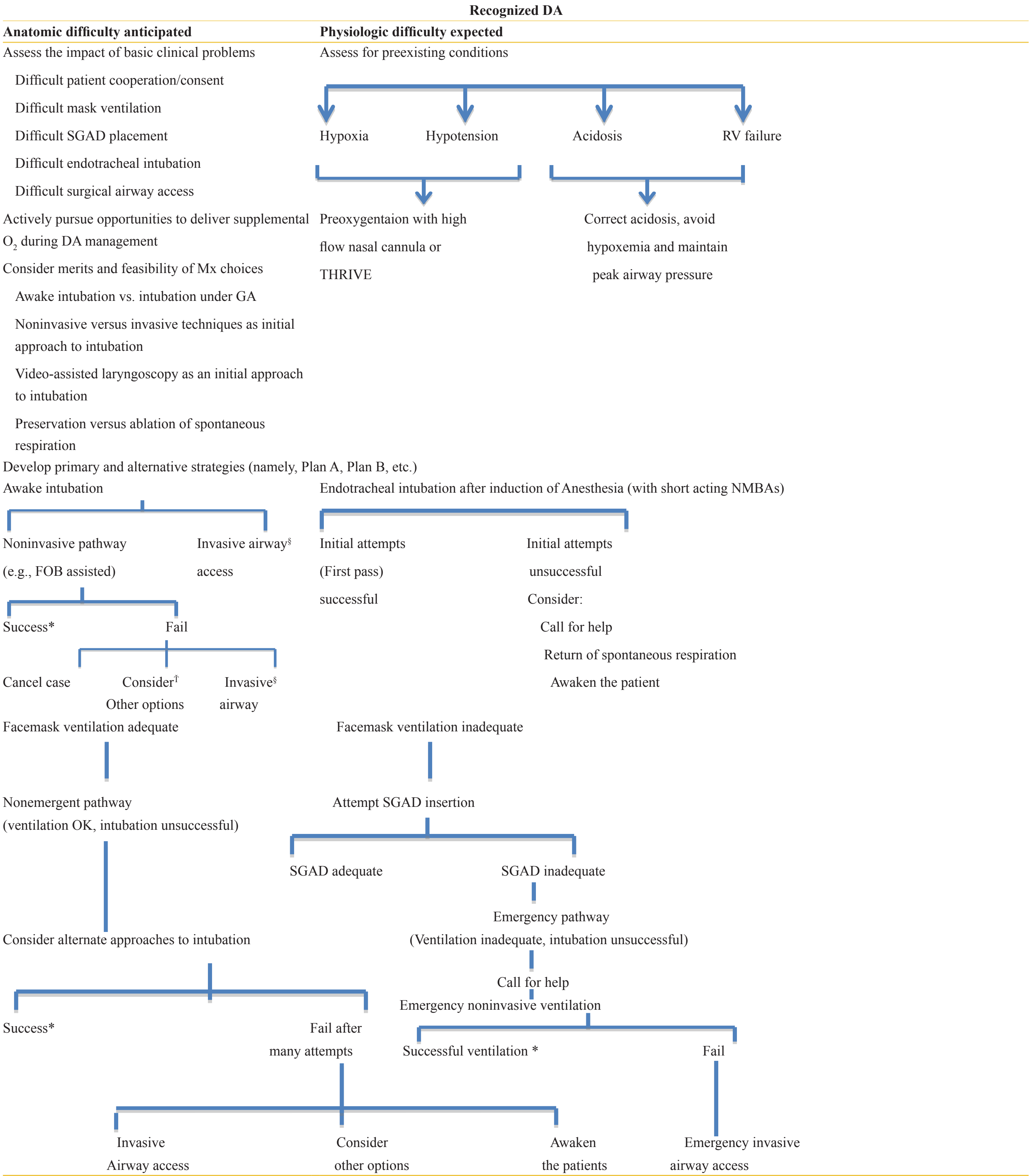
- Availability of well-equipped, organized difficult airway cart in operation theaters and other anesthetizing location. This DA cart can be customized depending on the availability of equipment and expertise of the operator.[10] The ideal cart should be easily portable and should contain a variety of equipment necessary for managing DA [Figure 2]. It should include various laryngoscope blades (straight/curved/special ones like McCoy), intubating stylets (Trachlight, Bonfils intubation fiberscope, etc.), intubating supraglottic devices (intubating laryngeal mask airway, laryngeal tube), supraglottic devices [Figure 3] (ProSeal laryngeal mask airway, laryngeal tube, I-gel, BASCA, etc.), other equipment for emergency surgical airway, video laryngoscope [Figure 4] and the fiberoptic bronchoscope (FOB) [Table 2]
- That the patient is informed regarding known or suspected DA
- That another experienced anesthesiologist is available to provide assistance at all the times
- Adequate preoxygenation before any anesthetic induction agent is being performed. Preoxygenation by Hudson mask ensures higher oxygen saturation values compared with patients who did not receive it. Furthermore, 3 min preoxygenation and four maximal breaths in 30 s maintain better oxygenation than 1 min of preoxygenation.[12] Similarly, postextubation oxygen supplementation decreases arterial desaturation during recovery and patient transportation.[13]
- Always give supplemental oxygen throughout the process of airway management [Table 3].

Table 3: Different reflexes and regional airway blocks to be given before awake intubation

Reflex	Nerve blocked
Gag	Glossopharyngeal nerve (internal or external approach)
Laryngeal closure reflex	Internal branch of superior laryngeal nerve (near greater cornua of hyoid bone)
Cough reflex	Internal branch of superior laryngeal nerve and recurrent laryngeal nerve (transtracheal injection of LA)
Cardiovascular reflex response (hypertension, tachycardia, and bradycardia)	Laryngeal and glottis receptors supplied by glossopharyngeal and vagus nerves
Palatine nerves and anterior ethmoidal nerve innervate the nasal cavity	Cotton soaked in LA is passed is placed for 5-15 min

LA: Local anesthetic

Figure 5: Algorithmic approach to physiologic and anatomic difficult airway followed at our department (adapted partly from American Society of Anesthesiologist Difficult Airway Algorithm, 2013)



*Confirm successful tracheal intubation, SGAD ventilation with capnography (exhaled CO_2), §Invasive airway access includes surgical or percutaneous airway, retrograde intubation, or jet ventilation, †When mask ventilation is adequate can continue short surgical procedure with facemask or SGADs (e.g., LMA, ILMA, iGel, LMA-Proseal, Baska, etc.) under local anesthesia or regional nerve blockade. THRIVE: Transnasal humidified rapid insufflation ventilatory exchange, NMBAs: Neuromuscular blocking agents, SGAD: Supraglottic airway device, FOB: Fiberoptic bronchoscope, GA: Glottic airway, DA: Difficult airway, RV: Right ventricular, ILMAs: Intubating laryngeal mask airways, LMA: Laryngeal mask airway

The management of DA in a cardiac patient is further complicated by the fact that anesthesiologists have to ensure a safe airway with minimum hemodynamic stress [Figure 5]. Although the airway management will take priority over concerns of hemodynamic disturbances due to sympathetic stimulations, awake intubation may be the safest option in anticipated DA. It ensures spontaneous breathing, preserves natural airway, prevents aspiration, and may be easier in an experienced hand.

Regional Blocks for Fiberoptic Intubation

Before attempting awake fiberoptic intubation, one must employ regional anesthesia pertaining to the airway. Steps to be followed before performing airway blocks:

A. Explain to the patient in detail about importance of awake intubation, reassure him and take informed consent
B. Antisialogogues such as injection glycopyrrolate (0.4–0.8 mg of IV) may be administered after excluding the contraindications, at least 30–45 min apriori to decrease the volume of oropharyngeal secretions
C. Appropriate regional blocks may be used (table), nebulization with 4% lignocaine, topical sprays, the airway to anesthetize the airway
D. Sedation – appropriate sedation is essential to maintain patients safety, comfort, and to minimize anxiety. For this purpose, before sedation, IV access, electrocardiogram, blood pressure, and SpO_2 monitors are attached
E. It is important to use appropriate sedation and anxiolysis to maximize patient safety and comfort and should be individually titrated to a desirable effect. Short-acting drugs such as midazolam, alfentanil, fentanyl, and dexmedetomidine may be used. An excessive sedation may lead to hypoventilation, hypoxia, and aspiration. The drug selection should also be based on the preexisting cardiac condition of the patient. Furthermore, we may use adjuncts that may be used to reduce hemodynamic responses to intubation. The commonly used drugs include:
    1. β-adrenergic blockers (e.g., esmolol bolus [0.25–1 mg/kg] or infusion [100–300 µg/kg/min])
    2. Vasodilators (e.g., nitroglycerin or nicardipine bolus or continuous infusion titrated to effect)
    3. Mixed adrenergic blocker: IV labetalol titrated to effect (bolus doses typically 10–20 mg)
    4. Use a titrated dose of IV induction once ETI has been achieved.

A properly prepared airway will ensure minimum response to ETI in patients.

Complications of Fiberoptic Bronchoscope

Gastric aspiration

This technique is possibly contraindicated in patients with high risk of gastric aspiration but is believed by most authorities to actually decrease the risk, by decreasing risk of coughing and gag reflex during intubation.

Risk of coughing

This block usually rapidly results in a fit of coughing, which should be considered in patients whom coughing is undesirable or contraindicated. This block is contraindicated in patients diagnosed with an unstable neck because it induces coughing. During the performance of the block, the patient should not talk, swallow, or cough, if possible.

Vascular injury

The needle does not need to be far off the midline of the cricothyroid membrane to encounter significant arterial and venous vessels. Pressure should be held over the injection site with an alcohol wipe after injection to prevent hematoma formation and subcutaneous emphysema.

Structural injuries

Surrounding structures, including the posterior tracheal wall and vocal cords, can be damaged, especially if the needle is not stabilized during injection of the local anesthetic or not removed immediately.

Intravascular injection

Intravascular injection aspiration should be performed before the injection of local anesthetic.

Systemic toxicity

Systemic toxicity can occur quickly when several different techniques are used. As with all regional techniques, there is a risk of systemic toxicity if maximum dosages of local anesthetics are exceeded. Topical anesthetics enter the circulation more quickly than when injected into tissues and can be absorbed in the respiratory and gastrointestinal tracts. Concentrations should be considered when using sprays or other such preparations. The lowest concentration possible should be used to minimize the risk of toxicity. Thus, one should keep a watch on combined dosages administered to avoid the risk of systemic toxicity.

Methemoglobinemia

Methemoglobinemia occurs when the ferrous molecule in hemoglobin is changed to its ferric state with essentially ionic bonds by oxidation. Injury or toxic agents convert abnormally large amounts of hemoglobin to methemoglobin, which does not function reversibly as an oxygen carrier. It may result in cyanosis and many other signs and symptoms, progressing to stupor, coma, and death.

Airway bleeding

It is not very uncommon to encounter bleeding in the oropharynx, hypopharynx, or even the tracheobronchial tree for various factors prevalent in this subset of patients. Cyanotic heart diseases are associated with coagulation abnormalities, and the mucosa is extremely labile for bleeding. This is further complicated by the use of heparin, which is a must for extracorporeal circulation for the performance of cardiac surgery.

Assessment of Block Efficacy

As with any airway blocks, the efficacy is evaluated by blunting of airway reflexes such as coughing and gagging, and diminished pain and cardiovascular response to instrumentation of the airway.

Blockade of anterior ethmoid nerve, the remaining portion of nasal passageway, is innervated by anterior ethmoid nerve. This can be blocked by topical application with anesthetic-soaked cotton pledgets.

Extubation of a Difficult Airway

Tracheal extubation during recovery from anesthesia is a complex process affected by many variables. Various anatomical and physiological derangements may further make it challenging especially in cardiac patients. Anesthetic complications after tracheal extubation are three times more common than during tracheal intubation and induction of anesthesia (4.6% vs. 12.6%).[14] The Fourth National Audit Project also reported that major airway complications (about one-third) occurred during recovery from anesthesia and approximately one-third of the reported cases relating to anesthesia.[15] Moreover, this rate has remained relatively constant over the years due to lack of guidelines for extubation.

The Difficult Airway Society in 2012 has described extubation strategies to reduce the complications during emergence from anesthesia.[16] They have stressed the importance of making extubation plans depending on patient condition, surgery done, and anesthesiologists' skill. They have divided the extubation into "low risk" or "high risk" and stresses on 4-step approach of extubation.

Plan

It is important to decide whether to extubate the patient in the awake or asleep state. The merits and demerits of "awake" extubation (complete recovery of airway reflexes but a greater hemodynamic response) and "asleep" extubation (less hemodynamic response but increased risk of aspiration and airway obstruction) need to be discussed with the perioperative team and individualized as per scenario.[17]

Prepare

We need to prepare the patient depending on the planning. Any modifiable factor (airway, patient, or anesthesiologist related) should be optimized, and extubation of the patient should be classified as low-risk or high-risk category.

Perform

Low-risk category

Extubate awake or deep as per the plan.

High-risk extubation

If extubation is considered difficult or chances of reintubation are high, for example, in patients with head and neck surgery, a major airway surgery or hemodynamic instability is needed (as in cardiac patient). In such scenarios, the anesthesiologist should decide for delaying extubation (for 24–48 h in ICU or tracheostomy) if he thinks it is unsafe to remove the ETT. Extubation of the DA should always be viewed as a potentially difficult reintubation. Therefore, one should always be prepared with techniques such as insertion of airway exchange catheter,[18] extubation over a FOB, and laryngeal mask airway exchange.[19] These need to be formulated depending on their availability and expertise. During emergence from anesthesia, ETT may lead to coughing, agitation, and hemodynamic disturbances. This may be deleterious, especially in cardiac patients. Infusion of the ultra-short-acting opioid like remifentanil may decrease cough and cardiovascular response to extubation.

Postextubation care

After extubation, the patient needs to be monitored closely for any complication. The patient details should be communicated to the staff in recovery, and a skilled anesthesiologist should be available in case of any emergency.[20] A DA cart should be kept ready for reintubation if the need arises. Extubation unlike intubation is an elective process and should be planned methodically with adequate time available to the anesthesiologists for a better outcome.[21-24]

Conclusion

It is unfortunate that one of the safest techniques for managing the DA is not yet a core clinical skill. In the realm of anesthesia, we are all likely to meet a patient who should undergo awake intubation, but not all anesthesiologist feel that it is within their repertoire to undertake one. The anesthesiologist who is contemplating awake intubation has a variety of options for providing airway regional anesthesia. Of all the modalities, the nerve blocks do require some degree of practice before the clinician can become proficient in their use. Trying to perform an unfamiliar procedure in an emergent situation is not advisable. As in all anesthetic practice, backup plans must be in place in the event of ineffective techniques. Familiarity with the ASA DA algorithm is mandatory. The ability to intubate through the use of FOB in an awake patient is very useful and a necessary skill. Carefully and rationally chosen airway regional anesthesia techniques make this an effective and comfortable procedure.

Considering the fatality of hemodynamic perturbations in a cardiac patient, maintenance of the cardiac grid is as important as an efficient DA management. A working knowledge of the pathophysiology of cardiac lesions will allow "split second" decision-making about the patient management. Recognizing the difficulties involved, cardiac anesthesiologists should be able to formulate alternative airway management plans in each case aided by the current guidelines. Most importantly, there has to be clarity about the available airway armamentarium so as to deal effectively with a recognized DA. A DA cart is indispensable for a quick and comprehensive airway management. Moreover, extubation is an elective process and therefore should be planned methodically for reducing the rate of reintubation, especially in a DA situation. Finally, airway simulations teaching the awake fiberoptic intubation including the airway blocks can go a long way in reducing the steep learning curve of airway management of cardiac patients.

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Conflicts of interest

There are no conflicts of interest.

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