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Difficult airway management in COVID times

The difficult airway has always posed varying degrees of challenges to the anaesthesiologists. Never before have had these challenges acquired a gigantic stature as they have during the present corona pandemic. This pandemic is necessitating and forcing the anaesthesia fraternity to bring some changes to the established definite algorithm of difficult airway management. Even the teaching manuals and protocols need to be modified to a varied extent taking into consideration the risks posed during normal intubation and ventilation in corona virus disease (COVID) patients. These risks are further amplified if one is confronted with a difficult airway. The Indian Society of Anaesthesiologists (ISA) national has in its recently published Advisory and Position Statement regarding the 'Corona Virus Disease 2019' (COVID-19) given important tips on airway management in suspected/confirmed COVID-19 patients in India.^[1,2] The All India Difficult Airway Association (AIDAA) has in this issue of the Indian Journal Of Anaesthesia (IJA) presented its Consensus Guidelines for airway management in the operating room (OR) during the COVID-19 pandemic.^[3]

Incidence of difficult airway in COVID-19 patients

Literature on this is as yet scarce, but case reports and communications are slowly coming up. Apart from encountering an unanticipated difficult airway, endotracheal intubation in COVID cases can become difficult and complicated because of several reasons like the use of personal protective equipment (PPE), lack of advanced airway equipment inside the OR (most of the equipment is kept outside on a spare airway cart with a runner or a clinician wearing PPE to get it if needed), unfamiliar surroundings, fear and cognitive problems in the airway manager and airway oedema caused by the corona virus.

An inflamed epiglottis with ulcers, extensive subglottic ulcers, upper tracheal and subglottic oedema leading

to failed extubation have been reported in good prognosis, ventilated COVID patients;^[4,5] nevertheless MacGrath *et al.* recommend 'leak test' to be performed before extubation and a plan to be kept ready for airway oedema, stridor and the need for possible re-intubation in COVID cases;^[5] however 'leak test' is an aerosol generating procedure (AGP) and its use is definitely debatable.

Difficulties accompanying endotracheal intubation in COVID-19 cases

A two-center retrospective observational case series from Wuhan, China found that out of 202 COVID-19 patients undergoing emergency tracheal intubation, the intubation success rate with rapid sequence intubation (RSI) was 89.1% on the first attempt and 100% overall. Hypoxaemia was common during intubation (73.3%), hypotension in 17.8% during and 22.3% after intubation, cardiac arrest after intubation in 2% cases, pneumothorax in 5.9% cases and 24 hour mortality after tracheal intubation in 10.4% cases.^[6] Pneumothorax cases have developed due to bad lungs and ventilator maneuvers that develop high pressures. Hypoxaemia and hypotension before intubation are predictors of cardiac arrest at the time of intubation. Some authors recommend the use of prophylactic phenylephrine, epinephrine, norepinephrine, reduction in the dose of propofol as an induction agent and/or 250 ml of crystalloid bolus if not in kidney/heart failure with volume overload.^[6,7]

Worsening of hypoxemia after induction of anaesthesia with hypoxemia developing during tracheal intubation despite mask ventilation has been reported. This could be a result of severe lung injury. At such times, supplementation of oxygenation by low-flow nasal oxygen/continuous positive airway pressure is recommended. Peri-procedural hypoxemia is prevented during intubation in obese patients

by provision of oxygen during the apneic period of intubation attempt.^[6]

Advancements adding to difficulties!

Although some innovations, techniques and equipment have been designed to prevent the transmission of infection during intubation and other anaesthesia procedures, these can further increase the difficulty of securing a difficult airway, as anaesthesiologists have not been accustomed completely with newer preventive equipment. These risks are further increased as difficult airway gadgets are not available uniformly in every set-up. Some excellent examples of such innovative equipment devised for intubation are the aerosol box (intubation/extubation box), plastic tents/sheets and acrylic face shields. These innovations are currently being discussed and displayed on social media. The United States Food and Drug Administration (US FDA) has recently issued Emergency Use Authorization for their use by health care providers during AGPs.^[8] Their use if available and feasible has been recommended by the AIDAA and ISA national for airway management.^[2,3] The optimal intubating position is very difficult to achieve with these devices. Nevertheless, the US FDA has cautioned against its use in certain patient populations like in patients with severe respiratory compromise requiring intubation, those with anticipated difficult airway and pregnant women.^[8] Some authors have pointed out the many 'cons' of the aerosol box including its bulkiness, crowding of instruments inside the box, contamination of inner surface of the box by aerosol and used instruments and poor protection of the staff assisting the airway manager.^[9] The successful use of the 'aerosol box' has been reported by several international and Indian authors and many modifications are underway in collaboration with biomedical engineers.^[10]

Functional challenges

All guidelines say that to increase the chance of first pass success, it is essential that the most experienced airway operator performs airway management as there is a high probability that intubation in COVID cases can become difficult and complicated as has been described above. Communication issues wearing PPE are common during airway management. Use of specific equipment like disposable ear-pieces, throat microphones and use of communication protocols used by airlines and the military are some novel solutions for these issues.^[4] Cook *et al.* mention 'closed loop communication' (repeat instructions back) and clear simple instructions to be given with adequate

volume without shouting.^[7] All these solutions require special devices and training. Nevertheless, the AIDAA suggests use of sign language for communication issues,^[3] and this does not need devices/training.

Sterilisation/sanitisation of the airway equipment used for a COVID case is another daunting task. It is extremely essential as this equipment can become a potential vehicle for transmission of infection from an asymptomatic/symptomatic patient to the non-COVID patient. This necessitates the proper sterilisation and/or sanitisation of airway equipment after every case. The AIDAA guidelines give repeated instructions on disinfection of reusable items and equipment in addition to recommending the use of disposable equipment and accessories for COVID cases.^[3] Keeping in consideration that the coronavirus is highly contagious and in case reusable equipment is used, there is a risk to patients, frontline staff and those involved in transport and decontamination of equipment. Hence, some guidelines^[2,7] recommend practical, single-use equipment wherever possible, though it may not be of the same quality as reusable equipment. Following manufacturer's instructions for decontamination of reusable equipment is also very important.^[7]

Challenges in training and education of health care workers

Donning and doffing of PPE kits, endotracheal intubation and extubation are recommended to be taught to all concerned health care workers by performing mock drills. However, there exist several more lacunae in the knowledge and skills of the health care workers and the anaesthesiologists and these have to be cleared through training programmes.

Endotracheal suctioning using closed suction system (CSS) is recommended for COVID-19 patients to decrease viral aerosol production. The multiple-use catheter in the CSS is enclosed in a plastic sheath and hence the nurse is not exposed to the patient's airway secretions. CSS has nowadays partly replaced open suctioning system even in routine intensive care units (ICU). However, CSS is still new in many settings in our country. A study showed that critical care nurses do not fully adhere to the best practice recommendations in CSS.^[11] There is therefore, a dire need for training and continuing education for COVID ICU staff in the use of closed suction.

A video laryngoscope (VL) is recommended to be used if available to improve intubation success and

to increase the distance between the patient's airway and the intubator's airway during the first attempt and the next two attempts in case of inability to intubate during the first attempt.^[1,3] The type of VL to be used and training in its use are important as all anaesthesiologists may not be familiar with their use. A disposable VL or a VL with a disposable blade/disposable cover is recommended.^[3,12] A VL with a separate screen to enable the airway operator to stay away from the airway is useful.^[7] The cost and availability of a disposable VL can be a limiting factor in this regard in some institutions.

Challenges in the choice of drugs and drug dosages for induction and intubation

The choice of induction drugs during airway management is very important. In an elective surgical case, the patient will be haemodynamically stable and drugs like midazolam, propofol and fentanyl can be used.^[1] In case of haemodynamic instability in emergency cases, drugs like etomidate and ketamine can be used to avoid cardiovascular collapse.^[1,7] The use of ketamine in COVID cases with myocarditis and tachycardia is again debatable. Keeping a vasopressor infusion/bolus ready in view of anticipated cardiovascular collapse during intubation in emergency surgical cases with haemodynamic instability is recommended.^[7] In fact, some practitioners are currently starting a prophylactic vasopressor infusion during intubation in the ICU in COVID cases and get the systemic blood pressure to rise upto an acceptable upper limit before attempting intubation. The AIDAA guidelines do not mention anything about induction drugs nor do they advise vasopressor infusions to be kept ready.^[3] Complete muscle relaxation is recommended before attempting intubation. The doses of the neuromuscular blocking agents (succinylcholine and rocuronium) are not mentioned in some guidelines,^[3] but most agree on giving suxamethonium 1-1.5 mg/kg or rocuronium 1.2mg/kg for successful rapid sequence induction and to avoid chances of the patient bucking and coughing.^[1,2,7]

Emergency airway management

In patients with facial trauma, head injury, respiratory distress, altered sensorium with diminished Glasgow Coma Scale (GCS) score, managing the intubation and difficult airway in the present COVID times pose additional risks to the anaesthesiologists. In such situations, apart from adhering to suggested guidelines, patients should be individualised and

attended accordingly considering the variable degree of difficulty in each on merit.

Airway management during transportation

The COVID patient being transported on trolley to the OR/ICU/wards/through an ambulance/lift may sometimes need oxygenation/mechanical ventilation. Intra-hospital transfer may be required from the emergency department to the wards, from the general floor to the ICU, and from the wards to the radiology suites. Outside hospital transfer can occur in an ambulance to higher centers. At such times of patient transport outside isolation, potential breaches of infection control can occur. The accompanying person should be a doctor or a nurse who is able to handle emergencies during transport. They will be wearing cumbersome PPE and this will make the patient's airway management difficult if needed. A preplanned dedicated transport route to each destination is important to ensure bystander safety. The security team should lead and ensure clearance of bystanders for the entire route ahead of the transfer team. Open breathing circuits, high-flow nasal oxygenation and non-invasive positive pressure are avoided during transport. Rescue and contingency plans during transport including assessing the need for intubation before transport, preparing transport equipment and drugs in anticipation of cardiorespiratory collapse, and gentle bagging by bag-valve-mask fitted with a HEPA filter in case hypoxaemia worsens during transfer.^[13] The type of circuit and ventilating device used is very important. If the patient is intubated, a single-patient-use Ambu bag with HME filter attached must be used. The ISA national advisory cautions against the use of a ventilator during transfer.^[1]

Readiness for airway management in remote locations

As the surge of COVID cases increases, we may encounter COVID cases in respiratory distress or undiagnosed COVID cases in sudden respiratory distress requiring urgent airway management in the isolation wards, general ward and in the radiology suite, wherein they may be brought to undergo radiological diagnostic procedures like a chest radiogram/computed tomography scan of the chest/ultrasonography of the abdomen/doppler studies to diagnose deep vein thrombosis. Airway management in such remote locations is difficult because of poor availability of oxygenation and ventilation equipment, lack of trained airway assistants and unfamiliar surroundings. At such times, the chances of infection

spreading to the health care worker will be more. So a high index of suspicion and proper personal care should be taken by the airway managers by using appropriate protective gear.

Role of tracheostomy/percutaneous tracheostomy during these times

Tracheostomy represents the third highest risk of COVID-19 transmission to staff after endotracheal intubation and non-invasive ventilation.^[14] It is, therefore, recommended to delay/avoid tracheostomies in these patients whenever clinically possible. In COVID patients with narrowing, oedema and ulceration of the trachea, tracheostomy can be performed as a life saving emergency procedure taking all the recommended precautions.^[4]

Continuous changes in health policies and recommendations about COVID-19 make it difficult to outline definite protocols for difficult airway management in patients with COVID infection. Lack of guidelines with strong evidence, fear of getting infected, work-overload, working with unfamiliar equipment and the changing clinical and epidemiological scenarios of the disease add to the miseries of the anaesthesiologist. The Corona tsunami continues to rock the world, and we anaesthesiologists are at its mercy in the OR and ICUs. Securing the airway swiftly and successfully without getting ourselves and the airway team infected should be our ultimate goal. The AIDAA guidelines^[3] are modified to suit the conditions in India. As stated by Cook *et al.*, the chosen technique may differ according to local practices and equipment. ‘Think globally, act locally, but, carefully’ should be our mantra for airway management during COVID times.

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