

Techniques for Establishing and Maintaining a Patient's Airway

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Abstract-

Whatever the technique employed, the wise provider will continually assess his progress in establishing and maintaining the airway. Signs of success include an increase in the rate or volume of chest rise, the production of a respiratory sound where there was none before, fogging in the tube of a tracheal intubation attempt, or colorimetric change in a CO₂ detector. Should these signs occur, it is important to secure the means of maintenance, as the drowning victim might be pulled from the water only to fall back in. Patients who show any decline in respiratory status, or those who have a high risk of doing so, should be promptly considered candidates for advanced airway management techniques. Remember that airway management can be a matter of life and death and bears a greater potential to help patients than to harm them, as long as the provider is conscious of the risks and benefits of each intervention. (van et al.2021)

For patients who have not suffered injury but who are unconscious or generally prone to loss of muscle tone, the recovery position of lying on one's side may prevent airway obstruction by allowing the tongue to fall forward from the posterior pharynx. This is generally suitable for all patients other than those at risk of aspiration of stomach contents or those with conditions compromising air exchange. Patients with facial trauma or some form of airway obstruction will likely need immediate and/or advanced airway maneuvers to ensure adequacy of ventilation. (Skellett et al.2021)

How profoundly a patient's airway should be managed depends largely upon the patient's level of consciousness and likelihood of maintaining a functional airway without intervention. For the unconscious patient, or for the conscious patient who has a high likelihood of losing consciousness, the job may be as simple as positioning the patient's head and opening the mouth. The patient's own muscle tone may be adequate, and the airway can be maintained with relatively little effort. Providing manual maneuvers have not been prohibited with a cervical collar, this class of patient will generally benefit from both the head tilt/chin lift and the jaw-thrust maneuver. In using these maneuvers, rescuer posture should always be positioned as perpendicular as possible to the patient's head to minimize the rescuer's exertion and to maximize control. (Singh et al.2020)

The goal of every emergency medical technician, paramedic, nurse, nurse anesthetist, trauma doctor, or primary care physician is to rapidly and correctly establish an airway so that delivery of oxygen to the lungs, and removal of carbon dioxide from the lungs, is assured. This is so fundamental to patient survival that it merits a significant investment of time and effort for every healthcare provider to become proficient in airway management. It may come as a surprise to some readers how many patients are mishandled in this seemingly simple aspect of their care, the victims of two or more rescuers who were ill-prepared or poorly coordinated in their approach to the patient's airway. (Cook et al.2020)

Keywords: airway management, endotracheal intubation, patient safety, critical care, emergency medicine.

1. Introduction to Airway Management

The incidence of anesthesia-related death has been falling from the 1950s until the 1980s. A study in New York City Hospitals showed a decrease from approximately 1 in 1300 to 1 in 6600. Recent data shows an increase in the 1980s with death rates in some Australian states, France, and Japan being double the rates in the 1960s. Temporal trends are also not consistent between countries with an increase in anesthesia-related deaths in New Zealand contrasted by significant decreases in England and Wales and in the United States. It is not clear why these variations in mortality have occurred, but a change in practice was probably responsible for the contrary trends between the United States and New Zealand. In both countries, the changes were related to cardiopulmonary resuscitation during anesthesia. Although the changes in the United States reduced the rate of awareness, they were also associated with an increase in death. In New Zealand, the opposite occurred with a reduction in death but at the cost of an increased rate of awareness. These changes demonstrate that we need to evaluate the effect that changes in practice have upon patient outcome. The same has been seen with airway management where assumptions about new techniques and devices have sometimes been proven wrong. Adverse incidents involving the airway are also a common source of litigation. In the United States, airway management has been cited as the leading cause of anesthesia-related deaths and brain damage. In the Australian Incident Monitoring Study, airway incidents were the third most common cause of major morbidity during anesthesia. This evidence indicates that it is imperative for anesthetists to have an understanding of the normal airway and the tools available for its management. (Schnittker et al., 2020)

With the development of modern surgical anesthesia and procedural sedation and analgesia, airway management has become an integral aspect of patient care. The ability to establish and maintain a patient's airway is a core clinical skill; failure to secure the airway can quickly lead to death or disability. In recent years, new airway devices and techniques have been developed that have both revolutionized and complicated airway management. These range from simple oral airways to sophisticated laryngeal mask airways and fiber optic intubation. Although it would seem reasonable to expect these advances to have improved patient safety, a recent editorial in the British Journal of Anaesthesia stated that there is no evidence that the new techniques and devices have improved patient outcome. (Bissett et al.2020)

2. Importance of Maintaining a Patient's Airway

Maintenance of a patient's airway is accomplished by a variety of methods designed to safeguard continued ventilation. Airway techniques are divided into two cost containment categories: those best performed by healthcare providers with limited training in the perioperative setting, such as conscious patients with upper airway obstruction, and the more aggressive maneuvers that are appropriately delayed until a patient's condition justifies their increased cost and risk. The latter category is most commonly employed in the emergency setting. Upper airway obstruction and hemodynamic or respiratory failure with a high risk of pulmonary aspiration are the common scenarios that necessitate aggressive airway management. Because of adverse sedation-related events and the greater complexity of care involved, it is best to manage such cases using an anesthesiologist and/or immediately following the patient's intubation and anesthesia. (Note: Because of overlap in the intent and techniques employed, some of the following airways are discussed in more than one section. Airway procedures associated with rapid sequence induction are presented in Part II.) (Lentz et al.2020)

3. Techniques for Establishing an Airway

A variety of airways are available to maintain patency of the upper airway. These range from oropharyngeal and nasopharyngeal airways to supraglottic devices. Or, secondary to a failed intubation, it may be necessary to establish a surgical airway. (Abdelmalak & Doyle, 2020)

The quickest and simplest way to establish an airway is to use a head tilt and chin lift to open the oropharynx. This maneuver is effective but must be maintained; when it is released, the soft tissues fall back and obstruct the airway once more. A jaw thrust is an alternative method for opening the oropharynx, which is ideal for use on a trauma patient with a suspected cervical spine injury; it does not move the cervical spine and so reduces the risk of further injury. Static anterior traction to the neck with an in-line immobilization also may result in less movement of the cervical spine than a head tilt. (Vonk et al.2020)

To create an account of the management of airway problems and of the techniques that can be used to achieve an open airway is beyond the scope of this document. Nevertheless, a brief summary of the methods for establishing an airway should be included.

4. Endotracheal Intubation: Procedure and Considerations

On the other hand, the benefits of intubation may not outweigh the risks and indications, and it should be delayed or not performed at all. An example of this is a patient with a witnessed syncopal episode and no evidence of head injury. Although there are some criteria to determine whether intubation is needed, each case must be assessed individually. A thorough understanding of the indications and the steps involved will ensure the right decision is made when the time comes to intubate. (Gill & Ruland, 2020)

The movement of the c-spine during BVM ventilation has led some physicians to make a blanket decision in favor of intubation over BVM. A poor prognosis with BVM ventilation (often defined by the lack of improvement in oxygenation, ventilation, or mentation) is another indicator for on-the-spot intubation. High-risk and indications such as these illustrate the benefits of intubation in emergency medicine. High-risk can also indicate the potential for a difficult intubation. This is when support from someone with advanced training in airway management, such as an anesthesiologist, is either required or strongly recommended. (Stankiewicz et al., 2021)

Intubation can help prevent the collapse of the upper airways and the subsequent respiratory failure in patients found lying down with an altered mental status. Intubation is often called for in trauma situations or when spinal injury is suspected or likely. In these cases, intubation is done because it reduces the movement of the cervical spine when compared to a patient being ventilated with a bag-valve-mask. Therefore, it is implemented as a precaution during bag-valve-mask ventilation. (Brown et al.2020)

Donald E. Garner defines endotracheal intubation as "the insertion of a cuffed, artificial airway through the mouth and then into the trachea." Usually facilitated with a sedative and muscle relaxant, intubation is simple enough and of great benefit to emergency medical personnel. It can be performed with little risk when the person has had the proper training and has a good understanding of the anatomy involved. (Holzki, 2020)

5. Complications and Troubleshooting in Airway Management

Complications can often be avoided by paying careful attention to proper airway technique and the patient's positioning. Maintenance of the head tilt-chin lift or jaw thrust maneuver will prevent airway obstruction in an unconscious patient. However, forceful or improper head tilt can result in cervical spine extension in a patient with a neck injury or, if combined with jaw thrust, can lead to dislodgment of dentures or dental fragments, all of which can potentially obstruct the airway. Placing an uncuffed endotracheal tube in a patient requiring positive pressure ventilation is a set up for aspiration and subsequent endobronchial intubation with one lung ventilation. Regurgitation with aspiration is a major risk with any airway management technique and can lead to severe pneumonia or acute respiratory distress syndrome due to instillation of gastric contents into the lung. Establishment of an airway in an obtunded head injury patient carries a high risk of vomiting and aspiration. Any patient lying supine is at risk for loss of airway patency due to obstruction from the tongue falling back against the posterior pharynx. This can be avoided by placing the patient in the lateral or sitting position whenever possible. Lastly, lack of experience or failure to recognize the limits of one's ability may result in a poorly secured airway. Learning advanced airway techniques on a patient in whom they are not indicated increases the risk of complications and practice on patients in the operating room is unacceptable. Any patient with a predicted difficult airway should have consultation with an anesthesiologist or other personnel with advanced airway management skills. (Lin et al., 2020)

In addition to the many benefits of securing the airway, the artificial airway can lead to a number of complications. It is well recognized that complications can occur at any time during the management of the airway, and the practitioner must be continually prepared to employ the appropriate interventions to resolve the complications. In fact, all of the methods for establishing and maintaining an airway discussed in the preceding sections can and do fail. Thus, the ability to quickly and accurately identify the problem, decide on a course of action, and skillfully implement the chosen intervention are essential skills for the person managing the airway. (Mushambi et al., 2020)

6. Discussion

When addressing airway management in out of hospital scenarios, it is important to consider whether a particular manoeuvre is safe. If aggressive jaw thrust may cause cervical spine movement, then head tilt and chin lift may be a safer option. If the risks and benefits of each manoeuvre with a particular airway device can be detailed, there may be scope for a procedural indication of a particular airway. This is an area where clinical practice and published evidence will overlap and evolve in the future. (Sharrock and Rosenblatt2020)

Discussion Controlled and safe airway management is a fundamental skill in the practice of anaesthesia. Accidental loss of the airway remains a significant cause of anaesthetic mishaps. A large proportion of these are avoidable if the correct equipment and techniques are utilized. Whether to use anaesthetic tubes, supraglottic airway, or whether to use in or out of hospital scenarios is a matter for clinical judgement. This essay will propose a hierarchy to aid this decision, asking whether it is possible to establish an airway using the four basic airway manoeuvres in section 1. For example, is it possible to jaw thrust and continue ventilation with a BVM or is a particular manoeuvre possible with a certain airway device. (Haydar et al.2020)

7. Conclusion

Conclusion: Airway maneuvers are a necessary skill for all levels of healthcare providers, especially those involved in acute patient care. Airway maintenance is a primary concern for unconscious or injured individuals, as without an open airway, life cannot be sustained. The airway should always be the first priority, as even with excellent assessment skills, a patient will not survive if the airway is not patent. Establishing and maintaining an airway is the responsibility of healthcare providers, and this can be achieved through various methods. Choosing the appropriate technique at the right time is crucial to prevent unnecessary disability or death caused by an obstructed airway. (Singh et al.2020)

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