

Second Edition

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Atlas of Emergency Medicine

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SECTION

1

The Airway

The Airway

Introduction

For all the invasive procedures outlined in this book there are widely varying practices for when individual techniques will be utilized. The following discussion pertaining to the airway describes a method of practice, realizing that different physicians will make different individual judgments. Although each case must be judged on need with respect to the requirement for invasive procedure, there are a number of general considerations which apply.

Adequate respiration is dependent upon adequate ventilation, oxygenation and circulation. It may be difficult to clinically assess pulmonary function by virtue of physical examination alone. Unfortunately, physiological parameters take time to develop, and many other factors affect vital signs besides oxygen supply. It is, therefore, imperative to maintain an aggressive approach to airway management. To always await the presence of clinical deterioration prior to intervention is to invite the occurrence of the preventable cardiac or respiratory arrest. Although it requires boldness to take control of a spontaneously breathing, awake patient, that is precisely what must be done in the context of an airway which may shortly be anatomically compromised. The patient with a penetrating gunshot wound of the neck is a case in point. Some comments on individual procedures follow.

Oral Airway Insertion

In general, we find oral airways to have limited utility. Being irritating, they provoke vomiting in many patients. They are frequently jammed into the mouths of seizing patients, increasing the risk of dental and oral damage.

The oral airway is most useful in the patient receiving assisted mask ventilation. Elevating the soft tissues of the posterior pharynx makes it easier to ventilate the lungs and minimize the amount of gastric air insufflation. The other occasional indication is in the orally intubated patient who is biting on his endotracheal tube. In general, however, if there is a need to continue the intubated state, we prefer to utilize a bite block, sedate or paralyze this patient with pancuronium rather than further provoke the gagging action with an oral airway.

Nasal Airway Insertion

We prefer the nasal airway when an upper airway is needed. It is less irritating to patients than the oral airway. To aid insertion, we recommend not only lubrication of the nostril but shrinking of nasal mucous membranes with Neo-Synephrine. The nasal airway is most useful in the patient with a somewhat depressed sensorium who does not require more active airway management. Our most common indication is in the postictal patient. It is also occasionally of value in the patient with alcoholic intoxication, as it will sometimes eliminate stertorous respirations and may sufficiently improve oxygenation to reduce agitation somewhat.

Assisted Mask Ventilation

Although this can be a very useful lifesaving modality, it has limited utility in the emergency department. It is frequently not possible to adequately ventilate a patient without extending the neck. Therefore, if the status of the cervical spine is unknown, this technique is contraindicated.

Vomiting is always a risk to the unprotected airway, and mask-assisted ventilation is particularly likely to induce vomiting in the patient with a full stomach. This being the likely condition of the emergency department stomach, vomiting is always a hazard. Our most frequent use of the technique is immediately prior to endotracheal intubation, such as in the cardiac arrest or drug overdose patient. In general, we feel that if there is an indication for a mask, there is an indication for tracheal intubation.

Oral Endotracheal Intubation

We prefer this route of active airway management when it is not contraindicated by an injured or possibly injured cervical spine. This preference is due to the opportunity afforded to directly visualize the larynx, ability to insert a larger bore endotracheal tube, greater ease of suctioning of the airway, lesser risk of epistaxis and, in most hands, a higher success rate of intubation.

There are a number of undesirable side effects of intubation, such as an abrupt rise in intracranial pressure; a release of catecholamines resulting in hypertension, tachycardia or tachyarrythmia; or a severe vagotonic reaction producing bradycardia, hypotension and, at times, respiratory arrest. These can often be prevented by pre-treatment with an intravenous bolus of lidocaine (1 mg/kg).

Moreover, we do not hesitate to paralyze patients who are agitated due to hypoxia or intoxication. It is a greater risk to fight an uncooperative

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patient than to take control with pharmacology. To minimize the risk of regurgitation during fasciculation, we pre-treat the patient in whom we plan to use succinylcholine (80–100 mg for the average adult) with 2 mg curare if time permits. This dampens or prevents fasciculations, but since one must wait about 5 minutes after the curare, there are some "crash" intubations which must occur without this protection. We prefer not to paralyze totally alert patients and use diazepam, 10–20 mg IV, to sedate them when there is no contraindication.

Although oral intubation is relatively contraindicated when the neck has yet to be cleared for cervical fractures, more work needs to be done to define whether one person can stabilize the neck while a second completes the oral intubation. Failure rate of oral intubation increases as one fails to visualize the vocal cords. Therefore, even if this double-person technique proves to be safe, an alternative route will still be required to achieve intubation in case of failure.

Nasal Tracheal Intubation

Although there are a number of theoretical advantages to airway control in this fashion, there are many practical disadvantages. Epistaxis is almost an invariable sequel. Although in most instances it is of small quantity and self-limited, at times it can be substantial and very difficult to control. Perforation of the esophagus, although not frequent, also can occur with any blind instrumentation, and nasotracheal intubation is no exception. A smaller tube must be used than would be the case with oral endotracheal intubation. This not only makes suctioning of the airway difficult but, at times, predisposes to kinking of the airway as the patient flexes the neck. Finally, success rates of nasal intubation are lower than for the oral route, especially in the apneic patient.

Nevertheless, we prefer the nasotracheal route in a number of situations. In the patient in whom cervical spine injury has not been excluded, nasotracheal intubation would appear to be safer than oral intubation, although this is not entirely proven. Successful nasotracheal intubation in such a case may save the patient a cricothyrotomy.

Another indication is in the patient who is spontaneously breathing and has indications for intubation but is unable to maintain a supine position. Examples include the severe asthmatic, the patient in pulmonary edema and the patient with oral bleeding. It is frequently possible to intubate the patient in an upright position after preparing the larynx or giving a bolus of intravenous lidocaine.

We particularly like this approach for the patient with epiglottitis who is being oxygenated and whose neck has been prepared for possible performance of a surgical airway should nasotracheal intubation fail.

THE AIRWAY

These patients may have marginal ventilation, and maintain their airway open by sitting up and leaning forward. Finally, we often utilize this route in the overdosed patient who is becoming somnolent. Many of these patients will not breath adequately spontaneously but become combative as soon as they are stimulated by attempts to pass an oral endotracheal tube. Nasotracheal intubation is an alternative to paralysis.

Other advantages of the nasotracheal technique are that the patient cannot bite the tube and that patients appear not to fight the tube as hard as the oral tube. When there has been facial trauma with blood or cerebrospinal fluid in the nostrils, however, it is wisest to choose an alternative intubation route to prevent intracerebral insertion of the nasotracheal tube.

Cricothyrotomy

Although, in general, we attempt to avoid surgical airway management, we believe cricothyrotomy to be the procedure of choice when it is indicated for emergent airway control. In the text we recommend extending the neck. Although this definitely makes the operation easier, it is possible to perform a cricothyrotomy without extension for the patient in whom cervical spine status is unstable or unclear.

Although the anatomy is relatively constant and the procedure requires less surgical skill than tracheostomy, we feel there is no role for cricothyrotomy in the field. There are but few indications for surgical airway management in emergency medicine, but they do occur and one must be able to perform the procedure rapidly. We would not perform cricothyrotomy on children under the age of 3 years because of the small size of the cricothyroid membrane below this age.

Percutaneous Needle Cricothyrostomy

This is a procedure which may become more common with improved ventilator technology. It is the one we would recommend under appropriate circumstances for the field, and it may become the surgical procedure of choice in the emergency department in the future.

Tracheostomy

There are even fewer instances requiring tracheostomy than cricothyrotomy. Our chief indication is the child who cannot be intubated and who is too small for cricothyrotomy. Every effort should be made to have this tracheostomy performed in an operating room by a pediatric surgeon.

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Another indication would be the adult who has destruction of his larynx by direct blunt or penetrating injury. In this latter instance, we would advise a very long vertical incision. On occasion, one will find a completely severed distal trachea retracted into the mediastinum. We have encountered a number of patients who were able to be ventilated from above even with complete transection of the trachea so long as the middle layer of the anterior cervical fascia was intact. Once this was severed surgically, the patients all developed severe respiratory problems. We emphasize the importance of the tracheostomy hook for maintaining control of the trachea. With complete severance, at times the distal tracheal stump can be grasped with towel clips to enable drawing it back into the neck.

Surgical airways are always more time-consuming and bloodier than any text describes. Even small venules bleed vigorously when the patient is hypoxic and in a state of constant Valsalva.

Oral Airway Insertion

Performance

- A. Open the mouth.
- B. Remove dentures and clear the airway of debris.
- C. Insert the airway so that the concave portion faces away from the tongue (Fig. 1.1).
- D. Rotate the airway 180°.

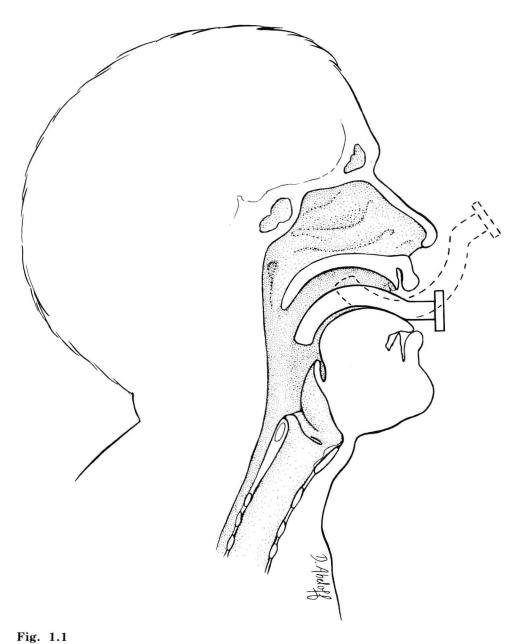
Errors and Complications

Failure to clear the airway of foreign material prior to insertion of the airway may result in aspiration. In unconscious or stuporous patients, vomiting may be induced by the insertion of an oral airway. Such a patient should be positioned so as to protect him from aspiration of vomitus.

It is possible to break teeth or lacerate the pharynx or tongue by too forceful insertion of the airway into the mouth of a combative or convulsing patient. A child's palate may be lacerated by attempted insertion of too large an airway.

Conversely, using too small an airway may increase upper airway obstruction because the airway may displace the tongue farther posteriorly. If oral trauma is present, a nasal airway is preferred.

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Nasal Airway Insertion

Performance

- A. Examine the nose for obstruction, foreign body or septal deviation.
- B. Place lubricant into the anterior nostril.
- C. Insert the airway with the concave surface facing the convexity of the nasopharynx (Fig. 1.2).

Errors and Complications

There is less danger of inducing vomiting with use of the nasal rather than the oral airway. Vomiting is still a hazard in children. However, the major complication following insertion of a nasal airway is the induction of nasal hemorrhage.

THE AIRWAY

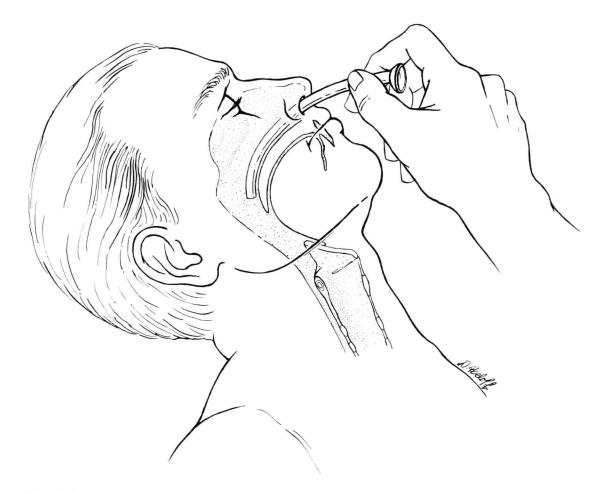


Fig. 1.2