

VIDEOS IN CLINICAL MEDICINE

Positive-Pressure Ventilation with a Face Mask and a Bag-Valve Device

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INDICATIONS

Providing positive-pressure ventilation with a face mask and a bag-valve device can be a lifesaving maneuver. Although seemingly simple, the technique requires an understanding of the airway anatomy, the equipment, and the indications.

Face-mask ventilation is used in patients who have respiratory failure but are still breathing spontaneously and in patients with complete apnea.¹ Face-mask ventilation can be indicated in any situation in which spontaneous breathing is failing or has ceased, including cardiopulmonary arrest.

CONTRAINDICATIONS

Face-mask ventilation is rarely contraindicated. However, caution is advised in patients with severe facial trauma and eye injuries.² In addition, foreign material (e.g., gastric contents) in the airway may lead to aspiration pneumonitis. In these circumstances, alternative approaches, including endotracheal intubation, may be necessary.

EQUIPMENT

There are many types of face masks, varying in design, size, and construction materials. Transparent masks are preferred because they allow for inspection of lip color, condensation, secretions, and vomitus.³ To maintain a good seal, the mask's size and shape must conform to the facial anatomy. Thus, several mask shapes and sizes should be readily available.

Various bag-valve designs are available. All have a self-inflating bag and a non-rebreathing, unidirectional valve. The valve is designed to function during both spontaneous and manually controlled ventilation. Because bag-valve devices can operate without an oxygen source, it is important to ascertain that supplemental oxygen is flowing through the bag-valve device when supplemental oxygen is indicated and available.

Test the bag-valve device's capability for delivering positive-pressure ventilation before use. This can be achieved by sealing the bag-valve device connector with your thumb and squeezing the bag with reasonable force. If it is difficult to compress the bag or if air is forced between the connector and your thumb, positive pressure can be delivered.

Whenever possible during face-mask ventilation, suction should be readily available. You may need to use airway-management adjuncts, such as disposable oral or nasal airways.

Before beginning face-mask ventilation, examine the patient's oral cavity. If possible, remove any dental prostheses or other foreign bodies that might be swallowed or aspirated.¹

ONE-HAND TECHNIQUE

The most common method used to hold the mask requires placing your thumb and index finger on the body of the mask while your other fingers pull the jaw forward and extend the head. Place your middle and ring fingers on the ridge of the mandible and the fifth finger behind the angle of the mandible.^{1,3}

The tongue is the most common cause of airway obstruction.⁴ It is important to minimize the pressure applied to the submandibular soft tissues because pressure may further obstruct the airway by pushing the tongue against the palate.¹ Maintaining an adequate seal while extending the patient's head, thrusting the jaw forward, and squeezing the bag with the other hand may require considerable manual strength and coordination. Extreme caution is advised in patients with cervical spine injuries, in which flexion or extension of the neck is contraindicated. In this situation, the jaw-thrust maneuver alone, without head extension, is recommended.⁴

TWO-HAND TECHNIQUE

You might find it difficult or impossible to maintain an adequate seal with only one hand. This is particularly true in the case of obese or edentulous patients or those with abundant facial hair. In these situations, hold the mask with two hands, with each hand positioned as described in the one-hand technique. A second person should compress the bag-valve device.¹

Regardless of the technique you use to ventilate the patient with a face mask, you can assess adequate ventilation by inspecting and auscultating the chest and abdomen. The rising and falling of the chest and breath sounds synchronous with the delivered tidal volume suggest adequate ventilation. Epigastric sounds and abdominal distension indicate gastric insufflation and poor ventilation.

USING OROPHARYNGEAL AND NASOPHARYNGEAL AIRWAYS

Occasionally, it may be difficult or impossible to provide ventilation unless a disposable oral or nasal airway is inserted. These devices are most helpful when the cough and gag reflexes are absent. Insertion in patients with intact reflexes may precipitate coughing, vomiting, and laryngospasm. When the use of a disposable oral or nasal airway is necessary, you must select the appropriate-sized device to avoid worsening the airway obstruction.¹ Estimate the correct size of an oral airway by holding it next to the patient's mouth. The tip should reach the angle of the mandible.

Insert the oropharyngeal airway by depressing the tongue with a tongue blade and advancing the airway toward the base of the tongue. Alternatively, you can insert the airway upside down and then rotate it 180 degrees as it is being advanced posteriorly.

Nasopharyngeal airways are better tolerated than oral airways when airway reflexes are present. They are useful when the patient's mouth cannot be opened. The simplest method of estimating their appropriate length is by correlating it with the external anatomy of the face and neck. Nasopharyngeal airways should be lubricated and advanced perpendicular to the face. Use them only with extreme caution in patients with facial injuries, basilar skull fractures, and coagulopathy, weighing the risk of further injury and bleeding against the need for oxygenation.¹

When the patient is breathing spontaneously, you must synchronize the delivered tidal volume with the patient's inspiration. Regardless of the presence of spontaneous respiratory effort, when excessive pressure is delivered to the airway, gastric insufflation may occur. This may lead to a vicious cycle of increased intra-abdominal pressure, which requires higher peak inspiratory pressures, predisposing patients to vomiting or regurgitation.



Figure 1. Mask sizes



Figure 2. Positioning the mask



Figure 3. Measuring the oral airway

COMPLICATIONS

Complications, including corneal abrasions and blindness in the presence of eye injury, can occur. Soft-tissue injuries, including injuries to the nose and lips, may result when excessive pressure is applied.

SUMMARY

Discontinuation of face-mask ventilation depends on clinical circumstances. Patients may require a more permanent or effective method of airway management, such as endotracheal intubation or tracheostomy. On other occasions, all that is needed for patients to recover completely is effective face-mask ventilation with oxygen.

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