

Lecture 2

Oxygen Delivery and Airway Devices

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Anesthesia Component of the 3rd year Surgical Medical Student Rotation

Nasal Canula

The NC used the nasal and oro-pharynx as an oxygen reservoir by instilling oxygen through the nares. 6 l/min fresh gas flow can increase the FiO₂ to 40%. A fresh gas flow of over 6 l/min does not increase FiO₂ further. Rapid rate or large tidal volume breathing decrease the maximally attainable FiO₂ by increasing the room air gas diluent in the pharynx.

Face Mask

The simple face mask can deliver an FiO₂ up to 60% with fresh gas flows up to 8 l/min. The face mask allows a higher FiO₂ than the NC by increasing the space in which room air and O₂ are mixed. Again, high tidal volume or rapid rate breathing decrease the attainable FiO₂.

Non-rebreather Face Mask

The NRFM is a modification of the regular face mask. A bag is added to further increase the volume of O₂ available during inhalation. Additional one way valve flaps are added to limit room air entrapment during inhalation. At 15 l/min the NRFM can deliver near 100% FiO₂. Maximum FiO₂ is, again, limited by rate and tidal volume.

Venturi Face Mask

A VFC is similar to a NRFC except that it adds a venturi-effect dial to select a specific FiO₂. This is most useful for emphysematous patients who depend on their hypoxic drive to breath.

Nasal Airway

The nasal airway is a small tube inserted through the nostrils in case of oropharyngeal airway obstruction. It stents open the naso- and –oropharynx thereby allow ventilation. If necessary this may be inserted in the awake patient with the use of lidocaine jelly or surgi-lube. Afrin (neosynephrine) may be squirted into the nares prior to insertion to decrease the risk of a nose bleed. Coagulopathies are a relative contra-indication to the use of nasal airways.

Oral Airway

An oral airway is a stiff plastic device with a hollow channel and a flange that is inserted into the mouth and oropharynx. It stents open the oropharynx and thus allows ventilation. It should not be used as a bite-block because of the risk of dental injury. Oral airways are sized in mm length. A 10 mm (red) OA will fit most men. A 9mm (yellow) will fit most small men and woman. A 6-8 will fit most older children. Sizes are available down to neonate sizes.

Anesthesia Mask

The anesthesia mask is designed to allow a tight fit over the patient's face. Several sizes from adult down to neonate are available. The round adapter fits on the anesthesia circuit and on an ambu bag. The mask is held with the thumb and index finger of the left hand over the patient's

nose and mouth. The left 3rd, 4th and 5th fingers lift the chin, mandible and angle of the mandible, respectively, into the anesthesia mask. The face is generally lifted into mask rather than the mask pushed down onto the face. The simultaneously facilitates the chin-lift, jaw-thrust and neck extension thereby maximally opening the patient's airway. Unstable neck injuries and not-yet evaluated neck injuries are relative contraindications to neck extension.

In case of large patients or patients with heavy beards, the mask may need to be held with both hands while an assistant operates the bag.

Laryngeal Mask Airway

The LMA is, in principle, similar to an anesthesia mask. It is inserted orally into the hypopharynx and the cuff inflated. The protruding end of the LMA fits on the anesthesia circuit or an ambu bag. As the LMA is only a mask airway device it may, in patient's with patent/baggable airways, be removed prior to emergence from anesthesia

It is important to note that an LMA does not definitively control an airway, i.e. it will allow aspiration of regurgitated gastric content and it may not necessarily allow positive pressure ventilation. It should not be used in patients who are deemed to be a "full stomach".

Endotracheal tube (Oral, Nasal, Rae)

Double Lumen Endotracheal tube

Tracheotomy – the process of creating a whole in the trachea, usually between the isthmus of the thyroid and sternal notch. The canula inserted during a tracheostomy may be cuffed or uncuffed. An uncuffed tracheotomy tube will not protect the airway from aspiration and may not necessarily suffice to deliver positive pressure ventilation.

Tracheostomy – the actual whole made during a tracheotomy.

Cricothyroidotomy