

VIDEOS IN CLINICAL MEDICINE

# Fiberoptic Intubation

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## OVERVIEW

Fiberoptic intubation is an integral part of caring for patients for whom airway access is expected to be difficult, but it is also used to secure the airway when unexpected difficulties arise.<sup>1-3</sup> The techniques vary, depending on whether the nasal or oral approach is used and on whether the patient is awake or anesthetized. The choice of equipment and medication depends primarily on the personal preferences of the physician.<sup>4-7</sup>

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## INDICATIONS

### *Nasal Approach*

Nasal fiberoptic intubation is indicated for patients in whom oral intubation is known to be or is expected to be difficult — for example, in a patient with a limited mouth opening or a supraglottic tumor. It is also indicated when the use of mask ventilation is expected to be difficult, such as in patients with morbid obesity, a beard, abnormal neck anatomy, or an airway that allows only limited visualization.<sup>8</sup> The presence of two or more such risk factors increases the likelihood that mask ventilation will be difficult.

Lack of patient cooperation precludes the use of fiberoptic intubation while the patient is awake — even in situations in which airway management is expected to be difficult. In such patients, general anesthesia should be induced only by very experienced anesthesiologists.

### *Oral Approach*

Oral fiberoptic intubation can be used when laryngoscopy is unexpectedly difficult in the already-anesthetized patient, provided that mask ventilation and therefore oxygenation are administered by means of a face mask until fiberoptic intubation can be performed.

## CONTRAINDICATIONS

Nasal fiberoptic intubation should be avoided in patients with severe maxillofacial trauma, since the fiberscope or the endotracheal tube could inadvertently enter the brain. Massive airway bleeding is a relative contraindication to nasal and oral fiberoptic intubation, which should be performed only by very experienced anesthesiologists.

## EQUIPMENT

For both the nasal and the oral approaches, you will need nonsterile gloves; a water-soluble lubricant; a flexible, armored, silicone endotracheal tube with an internal diameter of 6 mm; a 10-ml syringe; an antifogging agent; and tape and ribbon to secure placement of the endotracheal tube. The diameter of the flexible fiberscope should be between 3.7 mm and 4.1 mm. (Table 1 contains a complete list of the equipment and medications required.) For the nasal approach only, you will need a topical anesthetic with an atomizer; 0.5 ml of 10% cocaine nasal drops for vaso-

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**Table 1. Equipment and Medications for Fiberoptic Intubation.\*****Equipment**

Nonsterile gloves  
 Topical anesthetic with atomizer  
 Syringes, 2 ml (N) and 10 ml  
 Water-soluble lubricant  
 Flexible endotracheal tube, internal diameter 6 mm  
 Antifogging agent  
 Tape and ribbon  
 Flexible fiberoptic, diameter 3.7–4.1 mm  
 Slit oral airway (O)

**Medications**

Clonidine, 0.15 mg orally  
 Fentanyl, 2  $\mu$ g intravenously per kilogram of body weight  
 10% Cocaine nasal drops, 0.5 ml  
 2% Lidocaine  
 Etomidate, 0.2–0.3 mg intravenously per kilogram of body weight

\* The equipment listed is used in both the oral and nasal approaches to fiberoptic intubation unless noted otherwise; N denotes nasal only and O oral only.

constriction and local anesthesia of the lower nasal cavity; and a 2-ml syringe with a local anesthetic, such as 2% lidocaine, for local anesthesia of the larynx and the proximal trachea. For the oral approach only, you will need a slit oral airway.

**PREPARING THE PATIENT**

Explain the procedure to the patient and obtain informed consent. Give the patient a slightly sedating medication that does not induce salivation (e.g., 0.15 mg of oral clonidine or intravenous glycopyrrolate). Place a face mask on the patient during monitoring to provide 100% oxygen, administer 2  $\mu$ g of intravenous fentanyl per kilogram of body weight, and anesthetize the posterior pharyngeal wall with a topical anesthetic spray (this is particularly important for physicians who are fairly new to performing the procedure). Prepare the inferior nasal cavity by applying 0.25 ml of cocaine inside each nostril and close the patient's nose by pressing on both sides with your thumb and forefinger. Alternatively, ask the patient to do this.

**PREPARING THE EQUIPMENT**

While you are preparing the equipment, be sure the patient is being adequately oxygenated by means of a firmly applied mask. Lubricate the endotracheal tube and then thread it over the fiberoptic. Fix the endotracheal tube with tape or with an adapter for the fiberoptic. Check to ensure that the fiberoptic is flexible and provides a focused view, apply an antifogging agent to the tip of the scope, and then connect the oxygen source to the fiberoptic.

**NASAL APPROACH**

Stand above the patient's head and explain each step as you proceed. Hold the fiberoptic near its tip to get the best feel for the instrument as it proceeds through the lower nasal canal. When it reaches the posterior nasopharynx, ask the conscious patient to stick out his or her tongue, which will make it easier to advance the instrument toward the epiglottis. Simultaneously, lift the tip of the fiberoptic, making a slight downward movement with the thumb of the hand that is holding the instrument.

If the patient is heavily sedated, it can be helpful to use a tongue-traction maneuver. Working in the supraglottic region, administer 1 to 2 ml of local anesthetic through the working channel of the fiberoptic, simultaneously administering oxygen to propel the anesthetic into the area. Advance the fiberoptic posterior to the epiglottis and through the vocal cords, taking care to avoid any direct contact with the pharyngeal and laryngeal structures. You can facilitate the advancement through the glottis by making a slight downward movement with the tip of the scope. It is important to distinguish the trachea, with its rings and posterior tracheal membrane, from the esophagus, because the scope can be unintentionally advanced into the esophagus. Inject an additional 1 to 2 ml of local anesthetic through the channel of the fiberoptic. This stimulus induces a cough reflex that disperses the local anesthetic in the trachea. Make sure the fiberoptic remains in the proximal part of the trachea, since this is the only area that has been anesthetized.

Alternatively, you can inject the anesthesia directly by puncturing the cricothyroid membrane.

To induce general anesthesia in patients who are not in critical condition, I recommend the administration of 0.2 to 0.3 mg of intravenous etomidate per kilogram of body weight. Etomidate is not the drug of choice in critically ill patients because it may induce adrenal insufficiency<sup>9</sup>; agents such as intravenous midazolam or propofol should be used in these patients. In a patient whose airway is not severely

compromised, administering a hypnotic agent before advancing the tube can increase comfort and may also decrease the reluctance of an anesthesiologist to perform fiberoptic intubation in a patient who is awake. After the patient loses consciousness, advance the instrument toward the carina. No sedating medication should be given to patients with a severely compromised airway, not even during insertion of the fiberoptic.

Place lubricant at the orifice of the nose and on the cuff of the endotracheal tube. Use rotating movements to advance the tube. You may sense a slight resistance at the beginning of the nasal passage. Watch for the appearance of the endotracheal tube on the screen of the fiberoptic unit, and place the tip of the tube 3 to 4 cm above the carina. Remove the fiberoptic and attach the endotracheal tube to the ventilation system of the anesthesia machine.

#### ORAL APPROACH

If you find it difficult to visualize the larynx of a patient who is already anesthetized, and if you have tried conventional intubation without success, use bag-and-mask ventilation to maintain oxygenation. Then place a slit oral airway in a midline position. Ask an assistant to perform a chin-lift and jaw-thrust maneuver. Insert the fiberoptic at the midline and follow the posterior wall of the oropharyngeal airway. The end of the epiglottis can be easily recognized as you proceed. Advance the fiberoptic through the glottis, just above the carina.

When the insertion of the fiberoptic has been completed, remove the slit oral airway and use rotating movements to advance the flexible endotracheal tube, maintaining the position of the chin-lift and jaw-thrust maneuver.

#### CONFIRMING TUBE PLACEMENT

Confirm that the endotracheal tube is in the correct position by viewing it directly through the fiberoptic. It is also important to check the carbon dioxide signal on the anesthesia monitor, since the endotracheal tube may have become displaced during the removal of the fiberoptic. Auscultation over the stomach and both lungs in the midaxillary line should confirm correct placement.

#### SECURING THE TUBE

Using adhesive tape, fix the endotracheal tube onto the bridge of the nose; in oral intubation, affix the tube to the maxilla. Then secure the tape with a ribbon or other approved device to keep the tube from being displaced. Stabilize a flexible orotracheal tube with the previously used slit oral airway.

#### TROUBLESHOOTING

The most common source of problems that may occur during fiberoptic intubation is deviation from the standardized procedure. With this technique, the incidence of difficulty increases if you use a stiff, polyvinyl chloride tube instead of a flexible silicone tube. The flexible tube follows the curve of the fiberoptic more easily. The procedure will also be more difficult if you use an endotracheal tube with a sharp bevel rather than a tube with a soft end and no bevel. It is very important to preserve a very small gap between the endotracheal tube and the fiberoptic, since a small gap results in less frequent contact between the tip of the tube and the posterior arytenoid region (Fig. 1). When using oral fiberoptic intubation, be sure to perform an adequate chin-lift and jaw-thrust maneuver, and be certain that the slit oral airway is the correct size. In general, a number 4 slit oral airway is the appropriate size for adults. If the slit oral airway is too large, it will obstruct your view through the fiberoptic as you advance it toward the glottis.



**Figure 1. The Recommended Size of the Gap between the Tube and the Fiberoptic.**

It is important to preserve a small gap between the endotracheal tube and the fiberoptic to ensure successful advancement of the tube over the fiberoptic.

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## COMPLICATIONS

Minor complications include epistaxis and transient minor laryngeal injury, such as erythema and hematoma of the vocal cords; hoarseness may also result. If you adhere to a predefined standard procedure, severe complications, such as damage to the arytenoid, extensive hematoma of the pharyngeal wall, or aspiration, are unlikely to occur.<sup>10</sup>

## SUMMARY

Fiberoptic intubation is a standard technique used to manage the care of patients in whom airway access is known to be or is expected to be difficult. Most complications can be avoided if the physician strictly adheres to the protocol for the procedure. The video and this supplement are intended as an introduction for those learning the procedure. Fiberoptic intubation is best accomplished by those who perform it as part of their daily practice.<sup>11</sup>

No potential conflict of interest relevant to this article was reported.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.