

The Right Tool for the Job: Introducing the Distal Pharyngeal Airway (DPA)

Patients are more affected from lack of insufficient ventilation than lack of intubation.
– R McMurray

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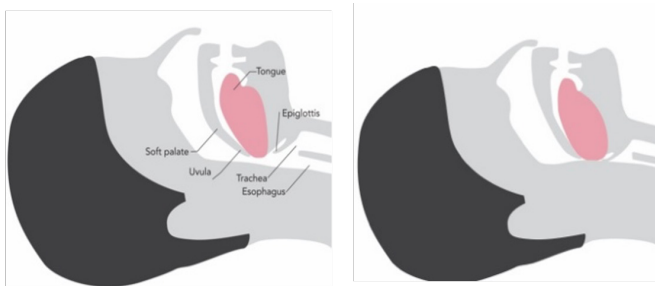
Anesthesia airway management is a crucial component of modern medical practice, enabling the safe and effective administration of anesthesia during surgeries and other medical procedures. In recent years, an aging population with a higher rate of obesity has made patients with a “difficult airway” more common than in the past. While it is possible to address a difficult airway by using external maneuvers, this creates risk for the patient and limits the medical staff. It is far better to have airway devices on hand that are specifically designed to address the problem of distal pharyngeal collapse. A range of such devices is discussed in this paper.

A PATENT AIRWAY IS CRITICAL

The history of airway devices dates back to the 19th century when the first oral airway was introduced to facilitate air passage during anesthesia (Haas et al., 2014). Since then,

many devices have been developed, including face masks, endotracheal tubes, and supraglottic airway devices, with each advancement aiming to improve patient safety and ease of use for healthcare providers.

Maintaining a patent airway during anesthesia is essential to ensure adequate oxygenation and ventilation. It prevents hypoxia and its associated complications, which can lead to brain damage, organ failure, or even death. A patent airway also allows for the delivery of anesthetic gases and efficient removal of carbon dioxide, which is crucial for maintaining a stable and safe anesthetic depth.



Pharyngeal airway anatomy and obstructed airway
Photo: McMurray Medical

Regrettably, some patients possess what is known as a "difficult" airway, a condition that arises when an anesthesiologist trained in conventional methods encounters challenges in providing facemask ventilation to the upper airway or performing tracheal intubation (Apfelbaum et al., 2022). Anatomical, physiological, or pathological factors contribute to this difficulty, heightening the risk of airway compromise and potentially resulting in insufficient oxygenation, ventilation, or both (Heidegger, 2021).

Frequently, airway obstruction triggers this issue, manifesting as the patient's inability to breathe or be ventilated, which significantly elevates the likelihood of negative outcomes (Morris et al., 2017). Swift intervention is crucial to avert hypoxia, hypoxic brain injury, or even death (Bhananker et al., 2006). In the perioperative setting, it can lead to increased morbidity, longer hospital stays, and higher healthcare costs (Weingart & Levitan, 2012).

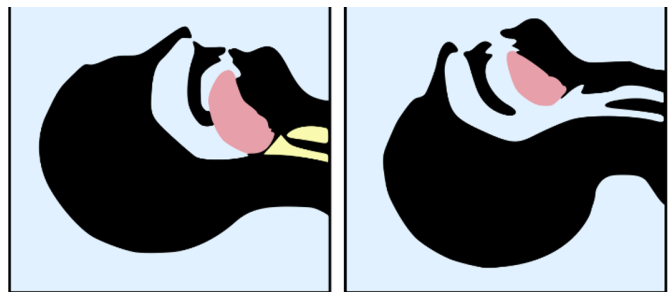
A CHANGING LANDSCAPE

Long-term demographic changes have made difficult airways both more common and harder to treat. The increasing prevalence of obesity, obstructive sleep apnea (OSA), and an aging population have contributed to a rise in difficult airways (Apfelbaum et al., 2022). Obesity can alter the

upper airway anatomy and function, making intubation and mask ventilation more challenging. OSA patients often have airway collapsibility and increased pharyngeal tissue, making airway management difficult. The aging population presents challenges due to reduced muscle tone, decreased respiratory function, and comorbidities that can complicate airway management.

Moreover, there has been a trend toward more patients receiving surgery in outpatient and non-operating room anesthesia (NORA) settings, which also contributes to the rise in difficult airways. The number of ambulatory surgery centers and NORA settings, such as interventional radiology, cardiology, and gastrointestinal suites, has grown significantly (Kuzhively & Pandit, 2019). These facilities often have limited resources, equipment, and personnel compared to traditional operating rooms. Outpatient and inpatient procedures have become longer and more complex, increasing the need for anesthesia technicians to be adept at knowing how to managing difficult airways. In this environment, anesthesia techs often have to cover multiple ORs or procedural rooms simultaneously, which can limit their ability to focus on individual needs and manage difficult airways or a crisis effectively.

The growth of NORA and outpatient surgery has also led to the increased use of deeper sedation, which can increase the risk of airway compromise and make airway management more challenging for anesthesia personnel.



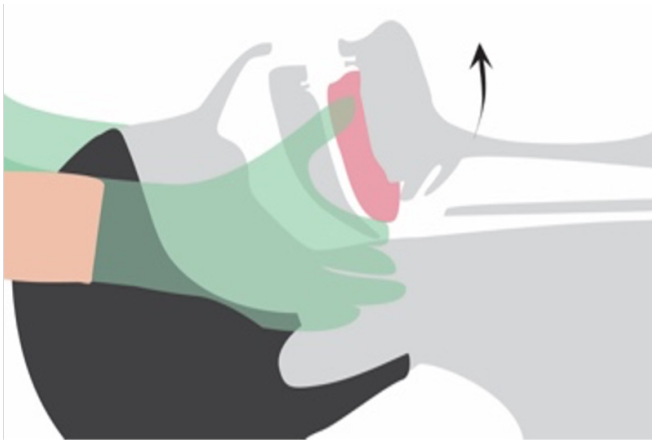
Chin lift maneuver.
Photo: Wikipedia public domain

Not surprisingly, NORA and ambulatory surgery centers have seen an increase in respiratory-related complications during surgery, which are five times higher outside of the traditional OR (Woodward et al., 2017). A recent study of liability claims found that respiratory depression was responsible for 21% of adverse events, with over half of these events being preventable with better monitoring and ventilation (Bhananker et al., 2006). Careful monitoring for apnea allows for early recognition and facilitates quick intervention, if

necessary, with the proper tools. Left untreated, apnea can result in hypoxia, respiratory function decline, asystole, and possibly death, with a mortality rate of almost 40% (Andersen et al., 2016).

HANDLING DIFFICULT AIRWAYS

Anesthesia personnel must be aware of the possibility of difficult airways. This requires a thorough preoperative assessment, including a detailed medical history, physical examination, and identification of risk factors such as obesity, OSA, or anatomic abnormalities.



Jaw thrust maneuver
Photo: McMurray Medical

Continuous monitoring of vital signs, including oxygen saturation, heart rate, blood pressure, and end-tidal carbon dioxide, is crucial for detecting early signs of airway compromise. Providing oxygen with an adequate delivery source is also important to maximize appropriate FiO₂ levels. Anesthesia personnel should be vigilant in recognizing any changes in these parameters, as they may indicate the need for intervention to maintain a patent airway.

The chin lift jaw thrust (CLJT) maneuver is one such initial intervention for managing difficult airways. It involves lifting the chin and pushing the jaw forward to open the airway, allowing for improved oxygenation and ventilation (Davies et al., 2014). The CLJT maneuver should be performed promptly when signs of airway compromise are detected.

While the CLJT maneuver can be effective in managing difficult airways, it also carries several drawbacks:

- *Patient risk:* CLJT may cause discomfort, bruising, or injury to the patient, especially if performed forcefully or for an extended period (McMurray et al., 2020).

- *Distraction:* Performing the CLJT maneuver may distract anesthesia personnel from other tasks, such as monitoring vital signs or administering medications.
- *Crowding/access:* The need to perform CLJT can contribute to crowding around the patient, limiting access for other healthcare providers.
- *Less efficient use of time:* CLJT may be time-consuming, delaying other aspects of patient care and prolonging the overall procedure.

If a mask is used, certain factors can make positive pressure mask ventilation more challenging. These include facial hair, which can interfere with the seal between the mask and the face, leading to inadequate ventilation. Additionally, a lack of teeth can cause difficulty in maintaining a proper mask seal, resulting in poor ventilation. Lastly, a high STOP-BANG score, indicating a greater risk of OSA, can make mask ventilation more difficult due to increased pharyngeal tissue and airway collapsibility (Chung et al., 2016).

It is important to weigh risk factors before deciding on an airway strategy. A difficult airway is more likely for individuals with obesity, OSA, or challenging head, oral, and neck anatomy. Patients with pre-existing respiratory conditions, such as asthma or COPD, or a history of smoking, may have limited respiratory reserve and are more susceptible to rapid desaturation. Obesity can lead to reduced functional residual capacity and increased oxygen consumption, making these patients more prone to desaturation. A history of smoking can impair pulmonary function and increase the risk of desaturation during intubation. In these cases, apneic oxygenation techniques, such as distal pharyngeal airway (DPA), nasal high-flow oxygen, or continuous positive airway pressure (CPAP), can help maintain oxygenation during intubation attempts.

THE RIGHT TOOLS

Having a range of airway devices readily available is crucial for managing difficult airways in patients with anesthesia (Davies et al., 2014). Anesthesia personnel should be familiar with the use, pros, and cons of each device, and know when to employ them in specific situations.

OPA (Oropharyngeal Airway). The oropharyngeal airway is a simple device used to maintain an open airway by preventing the tongue from obstructing the pharynx. The OPA can be used in unconscious patients without a gag reflex, particularly during bag-mask ventilation or when other airway devices are not available or contraindicated.

Pros:

- Easy to insert and remove
- Can be used in unconscious patients without a gag reflex
- Helps prevent obstruction by pulling the tongue forward
- Provides a better airway than CLJT

Cons:

- Ineffective in conscious or semi-conscious patients with an intact gag reflex, as it may induce vomiting
- Can cause trauma to the oral cavity and teeth if not inserted correctly or left in place for a long duration

NPA (Nasopharyngeal Airway). The nasopharyngeal airway is a soft, flexible tube inserted through the nostril to maintain airway patency. The NPA can be used in unconscious or semi-conscious patients, particularly during bag-mask ventilation or when oral trauma is present.



Airway devices

Photo: McMurray Medical

Pros:

- Can be used in conscious or semi-conscious patients with an intact gag reflex
- Less likely to cause vomiting compared to OPA
- Provides a better airway than CLJT

Cons:

- Risk of nasal trauma or bleeding if not inserted correctly
- May be contraindicated in patients with nasal fractures or coagulopathies
- Stimulating upon insertion

Nasal PAP. The Nasal PAP system, such as the SuperNO2VA (Vyair Medical Inc., Chicago, IL), is a noninvasive device that provides positive airway pressure (PAP) to maintain airway patency and improve oxygenation. The nasal PAP system is used for managing difficult airways in patients requiring analgesia, sedation, or during monitored anesthesia care.

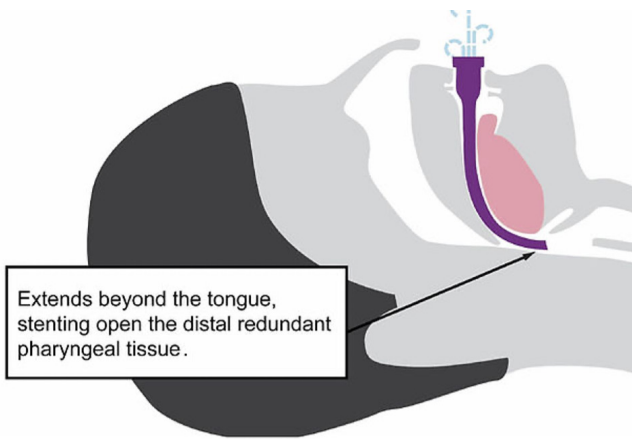
Pros:

- Can be used in conscious or semi-conscious patients
- Provides positive airway pressure to prevent airway collapse
- Allows for spontaneous breathing

Cons:

- May cause discomfort or nasal irritation
- Requires patient cooperation
- Positive pressure limits
- May leak through the mouth
- Requires set-up time

NHFO (Nasal High Flow Oxygen). Nasal high-flow oxygen is a noninvasive oxygen delivery system that provides heated, humidified, high-flow oxygen via nasal cannula. NHFO is beneficial for patients prone to desaturation during intubation attempts, those with respiratory distress, or when apneic oxygenation is needed.



Distal pharyngeal airway cross section
Photo: McMurray Medical

Pros:

- Improves oxygenation and reduces the work of breathing
- Can be used in a wide range of patients, including those with respiratory distress
- Provides apneic oxygenation during intubation attempts

Cons:

- Requires a specialized system and compatible nasal tubing
- May not be suitable for patients with severe nasal obstruction or facial trauma
- Requires set-up time

DPA (Distal Pharyngeal Airway). The distal pharyngeal airway is an oral airway device designed to sit right above the epiglottis, providing an airway passage that bypasses the upper airway structures. A DPA, such as the McMurray Enhanced Airway (McMurray Medical, Minneapolis, MN) can be used in unconscious patients with airway obstruction. It is particularly helpful in situations where intubation or mask ventilation is difficult or not immediately possible, such as in patients with facial trauma, limited mouth opening, or severe upper airway obstruction.

Pros:

- Easy and fast to insert, with minimal training required
- Can be used in patients with difficult airway anatomy
- Directly addresses distal pharyngeal tissue, a common site of obstruction

- Facilitates apneic oxygenation during intubation attempts
- Provides intraoral ventilation to bypass difficult mask ventilation
- Fits alongside an EGD bite block
- Has a cushioned bite block

Cons:

- Not suitable for patients with an intact gag reflex or at risk of aspiration

CONCLUSION


The paramount importance of maintaining a patent airway during anesthesia cannot be overstated. A patent airway ensures adequate oxygenation and ventilation, preventing hypoxia and other complications that could lead to patient harm.

This task is made more difficult with emerging healthcare trends. Changes, such as an aging population, increased obesity rates, and a higher prevalence of obstructive sleep apnea, make managing airways more challenging. The growing trend of NORA and ambulatory surgery further complicate airway management, as anesthesia technicians often need to cover multiple operating rooms and locations

Take-Away Points

- **Maintaining a patent airway is critical for patient health**
- **Demographic trends have increased the number of "difficult airways"**
- **The growth of NORA and outpatient surgery, with changed anesthetic practice, increases the need for additional airway tools**
- **Not having the right tools add to patient risk and reduce efficiency**
- **Anesthesia personnel need the right tools on hand for a range of airway types**

while also handling more complex procedures. As the prevalence of difficult airways increases, anesthesia personnel must be prepared to manage them effectively. This requires vigilance in identifying at-risk patients, close monitoring of vital signs, and having a variety of airway management techniques on-hand.

While the basic airway management techniques such as chin lift jaw thrust (CLJT) maneuver, OPA, and NPA can be useful in managing difficult airways, they also have several limitations. The CLJT can cause patient discomfort, distraction, and inefficiency. The OPA and NPA may not be long enough to reach the distal pharyngeal tissue to open the airway obstruction, especially in older and heavier patients with OSA. As a result, relying solely on CLJT, OPA, and NPA is not a sustainable solution for handling difficult airways. Anesthesia technicians should have access to a range of airway devices, such as distal pharyngeal airways, nasal high-flow oxygen, nasal PAP, and supraglottic airways. Familiarity with the pros, cons, and indications for each device will enable technicians to recommend the most appropriate tool for a given situation, ultimately improving patient outcomes and ensuring a safe and efficient anesthesia experience. 

Take the
QUIZ
on the
next page!

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Continuing Education Quiz

PAGE 1 of 2

To test your knowledge on this issue's article, provide correct answers to the following questions on the form below. Follow the instructions carefully.

- 1. Why is maintaining a patent airway crucial during anesthesia?**
 - A) To ensure adequate oxygenation and ventilation
 - B) To prevent patient discomfort
 - C) To reduce the risk of infection
 - D) To reduce medical waste
- 2. Which of the following is NOT a factor contributing to the increasing prevalence of difficult airways?**
 - A) Aging population
 - B) Increased obesity rates
 - C) Decreased smoking rates
 - D) Higher prevalence of obstructive sleep apnea
- 3. In the ambulatory surgery and NORA setting, which of these factors can complicate airway management?**
 - A) Anesthesia technicians covering multiple operating rooms and locations
 - B) Longer and more complex procedures
 - C) Deeper sedation
 - D) All of the above
- 4. What is the primary purpose of the chin lift jaw thrust (CLJT) maneuver?**
 - A) To provide supplemental oxygen
 - B) To secure an endotracheal tube
 - C) To open the airway and improve oxygenation and ventilation
 - D) To prevent aspiration
- 5. In which patient population is the use of an oropharyngeal airway (OPA) contraindicated?**
 - A) Unconscious patients without a gag reflex
 - B) Conscious or semi-conscious patients with an intact gag reflex
 - C) Patients with facial trauma
 - D) Patients with upper airway obstruction
- 6. Which of the following internal devices can be used in both conscious and unconscious patients?**
 - A) Oropharyngeal airway (OPA)
 - B) Nasopharyngeal airway (NPA)
 - C) Distal pharyngeal airway (DPA)
 - D) Nasal PAP (SuperNO2VA)
- 7. What is the main advantage of using a distal pharyngeal airway (DPA)?**
 - A) It can be used in patients with an intact gag reflex
 - B) It provides a completely secure airway
 - C) It directly addresses the collapse of the distal pharyngeal tissues
 - D) It does not require any specialized equipment
- 8. Which of the following is FALSE regarding use of the distal pharyngeal airway (DPA)?**
 - A) Fast and easy to place
 - B) Provides apneic oxygenation during intubation attempts
 - C) Can be used for intraoral ventilation to bypass difficult mask ventilation
 - D) Is inserted through the nostril
- 9. Which airway device provides heated, humidified, high-flow oxygen via nasal cannula?**
 - A) Nasal PAP (SuperNO2VA)
 - B) Oropharyngeal airway (OPA)
 - C) Nasopharyngeal airway (NPA)
 - D) Nasal High Flow Oxygen (NHFO)
- 10. Why is it important for anesthesia technicians to have a range of airway devices available?**
 - A) To manage a variety of difficult airways effectively
 - B) To reduce the need for specialized equipment
 - C) To minimize the use of sedation
 - D) To ensure all devices are compatible with each other

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The answers to the Fall 2023 "The Right Tool for the Job" Quiz are: (circle answers)

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| 1. A B C D | 5. A B C D | 9. A B C D |
| 2. A B C D | 6. A B C D | 10. A B C D |
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| 4. A B C D | 8. A B C D | |

Quiz 1

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