



Airway Management and Patient Positioning: A Clinical Perspective



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Dr. Cattano receives research grant support from Covidien.
Dr. Cavallone has nothing to disclose.

Patient positioning is an important aspect of anesthesia practice. Based on data from the American Society of Anesthesiologists Closed Claims Project database,^{1,2} advancements in research, improvements in airway management and education, and development of airway devices have resulted in a substantial decrease in respiratory complications—at one time the major cause of anesthesia-related morbidity and mortality. Meanwhile, other factors have started to be reported as sources of liability³—including complications related to patient positioning.⁴

Table. Positioning and Technique Options Proposed For Different Clinical Scenarios

Scenario	Positioning	Technique Options
Full stomach	Upright, awake Supine, cricoid pressure Head up/down controversy ⁸	FO DL, VAL
Compromised airway		
Intrinsic obstruction	Sitting upright Beach chair/supine	FO Awake tracheostomy DL, VAL, SGA, OS
Extrinsic obstruction	Sitting upright	FO
Unstable cervical spine	Manual in-line stabilization, supine, neutral position	FO, DL, VAL, SGA, OS
Thoracic spine	Prone ⁹	DL
Morbid obesity	Upright awake Beach chair asleep Ramp asleep Supine Prone awake ¹⁰	FO DL DL VAL, SGA FO
Rescued airway	Depends on patient position at time of lost airway	DL, SGA, VAL, OS, FO
Prehospital airway	Depends on patient position in prehospital setting ¹¹	DL, SGA, VAL
Protected extubation	Upright, awake Supine, “deep”	Awake with/without ETT exchanger With ETT exchanger
Simulation and research	As close to real situation as possible (The challenge is to create realistic scenarios and provide adequate instructions.) ¹²	All techniques

DL, direct laryngoscopy; ETT, endotracheal tube; FO, fiber optics; OS, optical stylets; SGA, supraglottic airways; VAL, video-assisted laryngoscopy devices

This clinical review will not deal specifically with patient positioning. However, current clinical perspective is that these changing sources of morbidity⁴ need to be considered also in relation to the use of new airway devices. For instance, we may consider the impact that new airway devices—such as video laryngoscopes and new intubating stylets (video-assisted, rigid/semirigid)—have on the incidence of adverse events, in addition to the importance of positioning the patient properly when using each device.⁵

In this review, we have categorized various positions proposed for airway management in different clinical settings. We briefly discuss evidence for any associated benefits and caveats, as well as the role of different airway devices in different positions and clinical settings.

positioning improve visualization—that may otherwise have been impossible—of the glottis or periglottic structures.

This review focuses on particularly challenging situations in which the choice of one position over another may be critical for successful intubation and maintaining adequate oxygenation while managing the airway, and ultimately for patient outcomes. We stress the importance of teaching these techniques to providers in training, with the aim of improving the success rate among novices. Specifically, we discuss 3 different positions and their usefulness in conjunction with different intubating devices and techniques.

Examples of challenging clinical situations and different positioning options are described in the Table.

Finally, we identify the anatomical and medical conditions of patients that, in different scenarios, lead to specific positioning decisions. The discussion will be limited to positioning for airway management in adults.

The sniffing position has been recommended as the optimal one for patient intubation and airway management. Historically, the definition of this position is credited to an Irish-born anesthetist, Sir Ivan Magill, who described it as “sniffing the morning air” or “draining a pint of beer.”

The effectiveness of the sniffing position compared with other “head-neck extension” positions has not been clearly established.^{6,7} The lack of scientific evidence to support one technique over the others is explored in this article.

Differences in positioning may be insignificant in the vast majority of patients and clinical scenarios that do not involve a difficult airway. However, such differences may become critical in situations when even small adjustments in head and neck

Sniffing Position

As previously mentioned, the sniffing position (Figure 1) is considered the optimal “classical” position of the head and neck for facilitating intubation. Proposed by Magill in 1936,¹³ Bannister and MacBeth reviewed the technique and published their observations in 1944.¹⁴ They analyzed the angles of the oral, pharyngeal, and laryngeal axes with the head in different positions for the purpose of identifying the best possible alignment of the 3 axes to expose the glottis and facilitate endotracheal tube insertion.

The following key components were identified: flexion of the lower cervical spine, extension of the upper cervical spine, and extension of the atlanto-occipital joint. The external landmarks of the position of the chin, the angle of the mandible with respect to the operating room (OR) table, and the position of the ears anterior to or at the same level of the sternum were noted and correlated with optimal exposure of the glottis.^{12,14,15-17}

The main advantage of this position is the optimal exposure of the glottis *for the purpose of intubation* with a Macintosh blade. Also, the position is advantageous for the anesthesia provider to facilitate the approach to the airway in the non-obese population (ie, optimal patency of the airway; ideal for mask ventilation).

Disadvantages and contraindications of the sniffing position include its inadequacy in obese patients (see section on ramped position) to optimize glottis exposure in direct laryngoscopy (DL),¹⁸ and the risk for spinal cord lesions in patients with known or suspected cervical spine injuries. In addition, some authors have questioned this positioning even for the “normal size, normal airway patient.”¹⁹

Recently, Brindley and colleagues¹² proposed that the classical analogy to “sniffing” may be taught better as “win with the chin” (referring to the best position for winning a footrace, namely “the chin wins the race”). The authors suggested that, with inexperienced providers, adequate positioning would occur more often using the “win with the chin” analogy than the sniffing one.

A new jaw-elevating device (Figure 2) is useful for maintaining a forced extension of the mandible and sustaining an open airway for sedation and asleep fiberoptic procedures.

Ramped or Head-Elevated Position For Morbidly Obese Patients

The so-called “ramped” position has been proposed to facilitate ventilation and visualization of the glottis for intubation in obese patients. The position may be achieved by placing blankets or other device (Figure 3) underneath the patient’s head and torso so that the external auditory meatus and sternal notch are aligned horizontally.^{18,20,21} The aim is to achieve the same “best alignment” of the 3 axes (oral, pharyngeal, and laryngeal) in obese patients that is achieved with the sniffing position in non-obese patients (Figure 4).

Both ventilation and the laryngoscopic view appear to be improved with the head-elevated position leading



Figure 1. The sniffing position demonstrated.



Figure 2. The JED, Jaw Elevation Device.

LMA North America Inc.

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to potential advantages, including increased rates of successful intubation and decreased rates of morbidity and mortality related to airway management.

Two caveats regarding the use of this position are worth mentioning, on the basis of recently published data.



Figure 3. The RAMP inflatable device (top); the Troop Elevation Pillow (bottom).

Rapid Airway Management Positioner; AirPal.
Troop Elevation Pillow; Mercury Medical.



Figure 4. The RAMP before being inflated (top); the RAMP after being inflated (bottom).

Note the posture of the head in the proper sniffing position with use of the inflated device (cuneus at atlanto-occipital joint) and the optimal head extension (transverse line between the sternum and external ear canal). Photo courtesy of AirPal.

In a 2009 study by Dhonneur and colleagues²² in obese patients, the use of 2 video-assisted laryngoscopy (VAL) devices (LMA CTrach, LMA North America, Inc; Airtraq, Prodol Meditec SA, LLC, distributed by King Systems) proved to be more effective in preventing oxygen desaturation during intubation than conventional DL performed by experienced senior anesthesiologists with patients in the ramped position.

In another study, Hirabayashi and Seo found that use of the Airtraq with an “in-line” (neutral) neck position was preferable to the sniffing position with the head extended for alignment of the 3 axes.²³

These data overall may indicate that a “neutral” position with use of a VAL device may be safer and more effective than simple DL, still using the ramped position.

Finally, although a direct relationship between obesity and difficult intubation has not been established, obesity has been shown to be an independent predictor of difficult mask ventilation²⁴; therefore, the risk associated with any intubation technique that abolishes spontaneous respiration should be considered when choosing an appropriate intubation technique in obese patients.

Beach Chair and Sitting Positions

These positions—which both require elevation of the patient’s head and torso with regard to the lower limbs, with flexion at the hips—have been proposed for airway management with both awake and asleep intubation techniques.

The main advantage of these positions is that they help prevent airway collapse in patients who are obese or have obstructive sleep apnea, or in the presence of anterior extrinsic airway obstructions. They have been advocated for use with intubation with fiber-optic bronchoscopy^{25,26} to maintain spontaneous ventilation.²⁷ Both positions also have been used for intubation performed after induction of general anesthesia and with DL.²⁸

To perform fiber-optic intubation with the patient in the sitting position, the anesthesia provider is generally in front of, and beside, the patient (Figure 5); the

bed height ideally is adjusted so that the head of the patient is lower than the provider's xiphoid process.²⁵ In the beach chair position, the head of the patient is "in line with the anesthetist's xiphisternum." If this position is chosen for DL, the provider may be "on a step and at an angle of the backrest."²⁸

One possible problem with the use of these positions (especially the upright sitting position) is that the anesthesia provider may encounter difficulty in performing a mask ventilation if it becomes necessary during the intubation process.

Clinical, Anatomical, and Other Special Considerations That Influence Positioning

The nature of the clinical scenario—whether elective or emergent, and with or without the possibility of managing the airway in advance—establishes the first main constraint of the decision-making process.^{29,30} Also important to consider are medical conditions that alter the anatomy and/or body habitus of the patient, which may significantly influence the choice of the appropriate position to secure the airway.^{31,32} In this category, we include scoliosis, rheumatoid arthritis, unstable cervical spine, and previous cervical spine surgery.^{33,34} Conditions that affect the patient's ability to maintain airway patency—eg, the presence of extrinsic or intrinsic obstruction of the upper airway,³⁵ or unusual positioning and airway rescue—also can be determining factors.³⁶

Less obvious modifications of the body habitus must not be disregarded. One example is how certain hairstyles can affect the ability to appropriately extend the superior cervical spine and the atlanto-occipital joint, as when a large mass of firm hair braids is pulled up at the back of the head.

In specific cases, the anesthesia and surgical team may find it necessary to orient the patient on the OR table in a way other than the "standard orientation" (head of the patient toward the anesthesia provider and the anesthesia machine) used for the majority of surgical procedures. For example, in situations when access to the patient's head or upper body is critically important for the surgical team, the setting or small size of the OR requires modifying the table orientation to achieve the desired setup.

At our institution, we have developed guidelines for managing the "threatened airway" (mainly, obstructed airway), when the surgical team—in this specific case, otorhinolaryngologists—may want the OR table oriented so that the patient's head is positioned 90 or 180 degrees away from the anesthesia machine. Such maneuvers necessarily call for extreme caution, careful coordination, and cooperation between the teams, and may increase the risk to the patient.

Another important factor to consider when determining the position and orientation of the patient in the OR is the availability of staff and equipment. Ultimately, optimal team cooperation, implementation of effective protocols, prompt and adequate availability



Figure 5. Optimal awake fiber-optic intubation.

The patient is in the beach chair position and the anesthesia provider uses the frontal approach, instead of the more common supine backward approach.

of resources, acquisition and maintenance of technical skills, and adaptability to diverse clinical scenarios all are fundamental assets for successful airway management.

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