

Review/Update

BLS Airway Management

In this article we're going to talk about opening the airway using simple manipulation. Our techniques are based on some myths that are propagated to this day; a better understanding of airway anatomy and what really happens in the unconscious patient will make you better able to manage the airway. I'll preface this by saying that my discussion is specific to adult patients because, frankly, the study I'll describe hasn't been done in children. We'll discuss differences in adult and pediatric airways later.

If we think about the upper airway and the opening to the lower airway at the level of vocal cords, we're talking about a fairly complex structure. The mouth and nose, while both openings to the airway, serve distinctly different functions and have distinctly different anatomy. The mouth opens into the oropharynx, a muscular structure containing in particular a large, dexterous muscle, the tongue, as well as teeth and a number of glands. The main purpose of this cavity is to bring food into the digestive tract and begin the process of breaking it down. The nares open into the nasopharynx, a specialized structure designed to filter, warm, and humidify air. The structures are, essentially, mucous membranes stretched over cartilage. The oropharynx and nasopharynx are divided by the anterior hard palate, a rigid structure, and the posterior soft palate, a floppy structure that minimizes reflux of food and fluid into the nasopharynx. These two structures empty into the pharynx.

At this point, we are looking at an area at the level of the mandible (jaw). One of the most sophisticated structural support systems in the body lurks just inferior to the mandible: the hyoid bone. The hyoid bone, a horseshoe shaped bone with the opening pointing posteriorly, is the only bone in the body that doesn't articulate directly with another bone. Instead, though an almost continuous set of ligaments, the hyoid attaches to almost

every structure in the anterior neck. The internal structures of the neck move wherever the hyoid moves. The hyoid is attached directly to the mandible so, when the mandible moves anteriorly, so does the hyoid. The hyoid is also attached to the tongue and, via the hyo-epiglottic ligament (remember that term), to the epiglottis.

Looking below the pharynx (in the hypopharynx), you will see the epiglottis, an anterior, leaf shaped structure that is essentially attached to the base of the tongue. Below this are the aryepiglottic folds, the false cords, and the true vocal cords or glottis, which serves as the entrance to the lower airway. All of these structures are thin layers of tissue overlying a series of cartilage pulleys, hinges, and levers. Movement of these cartilage structures (the thyroid and cricoid cartilage) allows you to speak, cough, and protect your airway. So, if I asked you "what is the most common cause of airway obstruction in an adult?" you would probably answer "the tongue." Although this makes some intuitive sense, in fact, a study in 1994 proved that the tongue does not obstruct the airway of the comatose adult patient¹. Although the tongue falls posteriorly and probably causes significant turbulence, the epiglottis and the soft palate are the only structures that actually contact the posterior pharynx and cause airway obstruction.

Considering airway anatomy again, how should we look at opening the airway? The goal is no longer to move the tongue off the posterior pharynx; it's not there in the first place. Instead, the goal is to move the mandible anteriorly. This maneuver pulls the hyoid anteriorly and, through the hyo-epiglottic ligament, pulls the epiglottis anteriorly, thereby opening the airway. The tongue will also be pulled anteriorly, decreasing airway resistance in the hypopharynx. If the mandible (and hyoid) is also displaced inferiorly, the oropharynx will open more, allowing more air to move through the oropharynx.

So, when one is performing the “basic” airway opening maneuvers (jaw thrust, head-tilt chin-lift), the actual goal is to move the mandible anteriorly and inferiorly, thereby opening the airway and maximizing airflow. If you watch someone open the airway using a one-person technique, you will see that he probably achieves a good anterior-inferior mandible movement. However, when that same person occupies both hands in performing one-person bag-valve mask ventilation, he no longer effectively opens the airway, and you see the “puffy cheeks” syndrome where patients have well ventilated cheeks but no air moves beyond the oropharynx.

So, how should your airway opening techniques change? First, you need to focus on moving the jaw anteriorly and inferiorly to maximize the airway in an open and low-resistance state. Second, you

need to use a two-person bag-valve-mask technique so that one person can focus on opening the airway and maintaining mask seal while the second person focuses on the ventilation itself. Third, as I discovered recently while intubating a patient who suffered neck trauma after being hit by a car, when the hyo-epiglottic ligament is severed, you can never open the airway with simple techniques; go straight to an airway adjunct (LMA®, Combi-tube®, etc.) or intubation rather than letting your patient get more hypoxic.

Reference:

- 1) Shorten GD, Opie NJ, Graziotti P et al. Assessment of Upper Airway Anatomy in Awake, Sedated, and Anesthetized Patients Using Magnetic Resonance Imaging. *Anesths Intensive Care* 22:165, 1994.