**Opening the Airway**

We recommend a series of physical maneuvers to open the closed or partially obstructed airway before resorting to artificial airways. Avoiding artificial airways avoids complications such as gagging, emesis, bleeding, helps focus on skill acquisition and prepares the trainee for the airway-intolerant patient, tight jaw or contraindications such as bleeding tendency.

When the patient appears at risk of obstruction and there is no contraindication (trauma) several airway maneuvers are combined in the first application of the mask: the head is moved into extension at the same time as the jaw is thrust forward (with mouth open); and support is placed behind the shoulders and head as soon as folded linens or pillows can be gathered. Here we consider airway maneuvers independently.

Simply pulling the mandible up to close the mouth as you apply the mask can open the airway by lifting the tongue off the posterior pharyngeal wall. Tilting the head back at the same time adds forward lift of the tongue. Observe that with head tilt, extension is limited to the a-o joint*, because extension of the lower cervical spine can allow the pharynx to close. Lower cervical spine flexion is indicated by arching the neck. Flexion of only the a-o joint is more likely when the hands are placed on each side of the head to lift and extend (Jackson).

* Technical note: In practice “atlanto-occipital” extension involves the atlanto-axial (C1-2) as well as the atlanto-occipital (C0-1) joint, because with extension and flexion of the head there is a complex interaction between these joints (Penning, Monu). Both have a sliding condylar rather than disk-compression mechanism for flexion-extension. The maximum range of their flexion-extension together is less than the sum of their individual components; the range for each joint is about 30 degrees, but the maximum sum is about 45 degrees (Penning). Flexion extension views reveal the position of the atlas relatively independent of the relationship between the occiput and the axis. In some individuals the posterior tubercle of the atlas may be closer to the occiput in flexion than in extension. (Monu 1986) As a consequence, in any position of the neck the atlas may be found either close to the occiput or closer to the axis (Penning 1978, Monu 1986). This variability weakens the value of assessing distance between the occiput and C1 or C1 and C2 spinous processes to predict difficult DL (refs – White and Kander 1975, Nichol & Zuck 1983).

If head tilt doesn’t open the airway or if the neck is seen to arch with extension (possibly resulting in paradoxical airway closure), jaw thrust and/or elevation of the head and shoulders is then indicated.

**Jaw thrust** is the most readily available next maneuver to open the airway. The mouth must be open for jaw thrust to be effective. If the mouth is closed the lower teeth are caught behind the upper teeth. Jaw thrust is a subluxation of the temporo-mandibular joint, so is resisted by the ligaments surrounding that joint. In a large person a fairly strong lift may be required for full effect. From above the patient’s head jaw thrust is effected by pressing on the anterior mandible with both thumbs while fingers 3, 4, and 5 providing strong lift behind the ramus. This positions the thenar eminences to hold the mask, which is positioned by an assistant, against
the face. Jaw thrust can be provided by an assistant from below by holding the jaw down with the thenar eminences and lifting the ramus with the fingers.

Soft palate flap valve:

In some patients, ventilation with the mouth closed results in the soft palate falling against the posterior pharyngeal wall and forms a one-way valve; inspiration through the nose is unimpeded but exhalation is blocked. This is avoided by immediate use of jaw thrust because the open mouth allows exhalation. Clinically the operator notices requirement for higher inflation pressure due to stacking, which could be mistaken for lower pharyngeal obstruction or decrease in pulmonary or chest compliance. Soft palate flap valve is diagnosed by observing chest deflation when the mouth is allowed to open, and improved effective compliance for the next breath or two. An oral airway prevents recurrence but if an airway is contraindicated, restoring mask seal over the open mouth allows free exhalation and prevents stacking. It requires practice to balance mask pressure down on the mandible sufficient to hold the mouth open without depressing the mandible enough to let the tongue fall against the posterior pharyngeal wall; and jaw thrust helps avoid the latter.

Levitan has recommended elevating the head to align the ear canal with the suprasternal notch to open the upper airway, because this is the position assumed by dyspneic patients when upright. Head elevation also usually makes intubation easier, so this position is a useful transition step to direct laryngoscopy. A high head support may cause flexion of the upper cervical spine to impair laryngoscope insertion due to contact between the handle and patient’s chest. That can be avoided by transferring more of the flexion to the upper thoracic spine, by placing a roll under the shoulders.

This position is similar to building a ramp as is routine for intubation of morbidly obese patients. This flexion of the thoracic as well as the cervical spine is exactly what Chevalier Jackson emphasized to expose the larynx in all cases where laryngeal exposure is difficult. Maximal head elevation is useful in most difficult cases, and the ramp is emphasized for the morbidly obese only because it is more difficult for the operator or assistants to lift their shoulders. So elevation of shoulders as well as the head is useful to minimize airway resistance while bagging, and also to position for intubation. Using a shoulder roll alone simply makes cervical extension worse, which impairs the pharyngeal airway and impairs intubation; the shoulder roll should not be used except with a higher head support.

Finally, if head tilt, head-elevated position, jaw thrust, and the addition of a second provider to assist with these maneuvers is insufficient to open the airway, then an oropharyngeal or nasopharyngeal airway should be utilized. These adjuncts are generally effective, but may be traumatic, may stimulate cough, gag or emesis, or may occasionally be unavailable in the correct size. In addition, the obtunded or dyspneic patient may resist their placement. It is imperative that they be placed gently in order to avoid hemorrhage that may further complicate airway
management. This is especially true for the nasal airway, which frequently abrades the friable nasal mucosa.

When placement of a nasal airway is elected, and when time allows, the airway should be preceded by a topical vasoconstrictor (such as oxymetazoline, or Afrin) and coated with a generous helping of lubricant. Lidocaine ointment may be useful for the patient in whom stimulation should be avoided. Serial placement of progressively larger airways helps to coat the nasal passage with lubricant and vasoconstrictor, as well as enlarging the passageway to accept a larger-lumen airway. Note that for many nasal airways, longer length is accompanied by larger bore, which may be more difficult to pass.