Optimal position for laryngoscopy – Time for individualization?

An optimal visualization of the larynx during direct laryngoscopy is needed to facilitate an easy tracheal intubation. Appropriate positioning of the head and neck is required to achieve this. In 1936, sniffing position (SP), described as "sniffing the morning air," was recommended by Sir Ivan Magill to obtain the best laryngeal exposure during direct laryngoscopy.[1] This position is achieved by elevating the head to flex the neck onto the chest at an angle of 35° and a 15° extension of the head at the atlanto-occipital joint.[2] The theoretical rationale was provided by the three axes alignment theory (TAAT), which stated that SP led to the alignment of the laryngeal, pharyngeal, and oral axes, thus making the line of sight fall directly on the glottis.[3]

Adnet *et al.* challenged the TAAT, since they did not find any alignment of the axes in a radiograph performed during laryngoscopy using SP.[4] However, this was criticized by Benumof as the angle of neck flexion was inadequate for SP (only 5°).[5] Adnet *et al.* performed a subsequent study in awake healthy volunteers using magnetic resonance imaging techniques and found that alignment of the three axes was impossible to achieve in the SP, neutral, or head extension positions.[6] Both SP and neck extension reduced the angle between the oral axis (OA) and pharyngeal axis (PA), while the angle between the PA and laryngeal axis (LA) was increased. These findings suggest that the alignment of the three axes is not required for a good laryngeal view; rather, the reduction of the angle between OA and PA, achieved by upper cervical extension, is more important to align the line of sight with the LA. The laryngeal view and intubating conditions could not be compared by this study.[6] Alternative theories to the TAAT have been proposed. Chou and Wu suggested that the airway being a three-dimensional space, extension of the head can displace the tongue to provide better laryngeal exposure.[7] With the "obstacle theory," Isono explained that the head elevation during SP and laryngoscopy displaces the anterior obstacles (tongue, epiglottis, and mandible) upward and head extension displaces the posterior obstacles (upper teeth, maxilla and head) downward, thus making the line of sight pass through the space created by these interventions.[8]

In addition to the glottic view, SP has been shown to structurally improve the pharygeal airway patency and provide wider mouth opening and the use of lesser force during laryngoscopy when compared with simple head extension.[9-11] However, Adnet *et al.* showed that SP provided no advantage over simple head extension during laryngoscopy under anesthesia. In this study, laryngoscopy was performed without the use of neuromuscular blockade, which may have lead to inadequate intubating conditions.[12] A meta-analysis of six randomized controlled trials found no benefit of SP over other position with respect to laryngeal visualization, first intubation success rate, or intubation time. However, SP was associated with a better Intubation Difficulty Scale (IDS) compared with simple head extension position. The authors suggested that SP should still be considered as the initial position for tracheal intubation as it provides easier conditions for intubation.[13]

The head elevated laryngoscopy position (HELP), a 25° head elevation, or back-up of the operating table improved glottic visualization during laryngoscopy in fresh cadavers[14] and in patients using the 25° back-up position compared with the supine position.[15] Direct laryngoscopy during "ramped" position (RP) using blankets placed under the head and upper body until horizontal alignment between the external auditory meatus and sternal notch (AM-S) was achieved and provided better glottic visualization when compared with SP, in morbidly obese patients.[16] RP and HELP were found to be equivalent for direct laryngoscopy in obese patients in one study,[17] but RP was shown to provide superior glottic visualization in patients who were obese and nonobese in another.[18] The optimal position for laryngoscopy in critically ill patients, however, remains unclear, as a recent multicenter randomized study in intensive care unit patients showed RP to worsen the glottis view.[19]

In the current issue of the journal, Pachisia *et al.* conducted a randomized cross-over study in 100 patients comparing the glottic view and intubating conditions with SP using a 7-cm pillow and RP using an innovative inflatable pillow to individualize the head elevation required to align AM-S.[20] The RP group with individualized head elevation had higher CL-grade-I view, lower CL-grade-III, and better IDS compared with SP during laryngoscopy. The average head elevation required to achieve AM-S alignment was 4.92 ± 1.46 cm.

Previous studies which have shown superiority of RP over SP have used either a 25° head elevation or stacked blankets/towels to achieve AM-S alignment. The authors used a very simple innovative inflatable pillow, using two pressure infusion bags connected with a three-way device to a single inflation bulb. This was placed between two firm surfaces and encased by a cover. This device is not only of

low cost but also has the advantage of being noncompressible, easy to use, and can achieve the desired AM-S alignment quickly, by individualizing the inflation required, unlike with stacking blanket/towels. A small pilot study with an inflatable pillow using a progressive inflation of a pressure bag found favorable glottic views on laryngoscopy as the AM-S alignment was achieved.[21] Another study compared three intubation positions facilitated using a special inflatable pillow. The elevated SP was associated with the least number of CL grade ≥3. However, though an inflatable pillow was used, the degree head elevation was not individualized.[22] A patient positioning device called rapid airway management positioner (RAMP) was shown to effectively position morbidly obese patients in the HELP position, facilitating better laryngoscopic view and mask ventilation compared with the neutral position.[23]

The strength of the study by Pachisia *et al.* is that laryngoscopic assessment of the glottic view was conducted in both positions in the same patient in a randomized fashion. Instead of comparing different fixed pillow heights, they individualized the height of the pillow to achieve AM-S alignment. The study was not blinded and hence there could be a potential for bias; however, blinding is difficult in this setting. The studies that used inflatable devices have not measured the inflation height at which this AM-S alignment was achieved. Some studies have found the best possible laryngeal view with greater elevation of the head and neck beyond the SP during laryngoscopy.[21,24,25] This may be due to different patient populations and racial variations. These findings further support the use of individualized head elevation.

The anatomy and biomechanics of the airway structures vary among patients and differ in response to head and neck positioning. In addition, different types of laryngoscope blades, the force used during laryngoscopy, and operator experience further complicate all possible combinations to be tested easily, to determine the ideal position for direct laryngoscopy. While recent studies have found the RP or HELP to be superior to SP, the degree of head elevation required to facilitate the AM-S alignment is variable among patients. Thus, the time has come to abandon the conventional head rests of fixed height and move toward dynamic, inflatable head rests during direct laryngoscopy. It is time for individualization, rather than using a "one size fits all" approach for patient positioning for laryngoscopy. Finally, alternate intubation techniques and devices such as videolaryngoscopes and flexible bronchoscopes may make these issues seem obsolete. However, anesthesiologists should strive to find better techniques to optimize the glottic view during direct laryngoscopy, until such time that it is still performed.

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