ASA DIFFICULT AIRWAY ALGORITHM: IMPORTANT NEW DEVELOPMENT

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Review of American Society of Anesthesiologists (ASA) algorithm

Recognition of difficult airway: algorithm includes 11-step preoperative airway evaluation scheme; follows line of sight anesthesia provider must take from upper incisors to vocal cords; examinations (steps 1 to 4) involve focus on teeth; focus then shifts to side of mouth and pharynx, and, finally, to mandibular space and neck

Step 1: determine length of upper incisors; long incisors prevent axis of laryngoscope blade from entering mouth caudally (teeth press down on proximal end of blade, or prevent clinician from lifting blade to permit caudal entry); grade 2 view — ability to see corniculate cartilage (bumps at bottom of vocal cords; often mistaken for arytenoid cartilage; only 2-3 mm deep); probability of getting tube through vocal cords >90%; grade 1 view — ability to see any portion of vocal cords; probability of getting tube through vocal cords >99%; probability of successful intubation decreases if neither vocal cords nor corniculate cartilage visible; lengthening incisors by 1 mm costs anesthesia provider 1 mm of “wiggle room” at proximal end of blade; end result is loss of 2 to 3 mm at distal end and loss of grade 2 view (chances of successful intubation markedly decreased)

Step 2: determine whether patient has overriding upper incisors (“buck” teeth); prevents caudad entry of laryngoscope blade and forces laryngoscope to enter mouth in cephalad direction

Step 3: determine when patient can open mouth and inter-incisor distance; normal mouth opening — 5 to 6 cm (suggests TMJ within normal limits); restricted mouth opening suggests TMJ may be frozen (condyle unable to rotate within temporal bone fossa); if mouth “locks” at 2 to 3 cm, suggests that condyle can rotate but not translate; clinician can manually dislocate jaw forward; for direct laryngoscopy, inter-incisor distance must be ≥ 3 cm so that laryngoscope blade can enter mouth without damaging teeth

Step 5: determine and provide relative to size of pharynx; small tongue permits view of uvula and tonsillar pillars; oropharyngeal (Mallampati) classification estimates size of tongue, pharynx, and relationship between both (allows clinician to estimate ease of moving tongue)

Step 6: estimate height and width of palate arch to estimate lateral volume of oropharynx; if patient has narrow pharynx, laryngoscope blocks view of vocal cords

Step 7: determine position of larynx relative to lower airway; determine length of mandibular space by measuring thyromental distance (degree to which larynx rides posteriorly, which affords better line of sight from upper teeth to vocal cords and easier intubation; optimal distance — 3 fingerbreadths between inside of mentum and thyroid notch)

Step 8: with fingers still in mandibular space, determine extent to which patient can open mouth and inter-incisor distance; normal mouth opening — 5 to 6 cm (suggests TMJ within normal limits); restricted mouth opening suggests TMJ may be frozen (condyle unable to rotate within temporal bone fossa); if mouth “locks” at 2 to 3 cm, suggests that condyle can rotate but not translate; clinician can manually dislocate jaw forward; for direct laryngoscopy, inter-incisor distance must be ≥ 3 cm so that laryngoscope blade can enter mouth without damaging teeth

Educational Objectives

- The goal of this program is to improve management of the difficult airway. After hearing and assimilating this program, the clinician will be better able to:
  1. Recognize when a patient’s anatomy is likely to complicate intubation.
  2. Assess the likelihood of successful intubation on the basis of the grade of view.
  3. Identify and prepare for factors that may decrease compliance of the mandibular space.
  4. Determine when an awake intubation is indicated.

- It is acceptable to resort to mask ventilation if the laryngeal mask airway with fiberoptic intubation method of intubation fails.

- Preoxygenating a patient in 4 deep breaths over 30 sec saturates the tissues as thoroughly as the traditional method of providing oxygen for 3 to 5 min.

- It is recommended to avoid using mask ventilation if the laryngeal mask airway with fiberoptic intubation method of intubation fails.

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cancer, hematoma, abscess, inflammation, infection, edema, radiation exposure, scarring) can decrease compliance.

Step 9: determine cervical range of motion; greatest priority: patient’s ability to assume sniff position (neck slightly flexed on chest; head severely extended on neck).

Awake intubation: consider if patient has components of difficult airway; patient’s acceptance of necessity of awake intubation most important aspect of preparation; next, administer glycopyrrolate to dry airway; administer topical anesthesia; with proper preparation (ie, ensuring “quiet field”), any intubation technique feasible; flexible fiberoptics recommended.

Step 10: determine thickness of neck; thicker neck—helpful in some patients (but source of risk) with repeated attempts when first optimal attempt unsuccessful; best fallback plan permits continuous ventilation; if method fails but mask ventilation still possible: options—delay surgery; proceed, using mask ventilation (LMA) for intubation; if patient has no significant muscle tone and in optimal sniff intubating position (15º neck flexion on chest; head severely extended on neck) with direct visualization of optimal attempt; obtain surgical airway while maintaining mask ventilation.

Indications for abandoning intubation after repeated attempts: if optimal attempt at laryngoscopy and intubation unsuccessful, move on to other options; components of optimal attempt—clinician experienced; patient has no significant muscle tone and in optimal sniff intubating position (15º neck flexion on chest; 85°-90º of head on neck at atlanto-occipital joint level); laryngoscope; use of optimal external laryngeal manipulation (pressure on thyroid cartilage to bring vocal cords into view) on first attempt; one change of length and type of blade permissible; no benefit (and creation of risk) with repeated attempts when first optimal attempt unsuccessful; best fallback plan permits continuous ventilation.

Use of laryngeal airway (LMA) with fiberoptic intubation and continuous ventilation: insert intubating laryngeal airway (eg, Cookgas, Air-Q LMA; Airway Management Devices, Inc, San Diego, CA) —look through fibroscope; visualize vocal cords (usually in center of LMA bowl); remove fibroscope and adapter; insert a stylet; use a laryngeal mask; look for bronchoscopy elbow on tube; continue ventilating around bronchoscope, down tube into view; view remains constant; insert scope through cords, then push tube in over scope; break system momentarily by removing endotracheal tube and adapter; push tube in using tube extender and pull out LMA, and hook up endotracheal tube as usual.

If method fails but mask ventilation still possible: options—delay surgery; proceed, using mask ventilation (LMA) for intubation; if patient has no significant muscle tone and in optimal sniff intubating position (15º neck flexion on chest; head severely extended on neck) with direct visualization of optimal attempt; obtain surgical airway while maintaining mask ventilation.

Indications for abandoning mask ventilation: failure of optimal attempt; components of optimal attempt—bilateral jaw thrust and mask seal (requires bilateral jaw thrust and mask seal); insertion of large oropharyngeal airway; consider bilateral naopharyngeal airway (always use laryngoscope to see whether instrument is in use).

Rescue options: employ if intubation and ventilation impossible; request surgical airway; consider attempting LMA first, awake patient, and resuscitate surgery with alternative plan (eg, awake ventilation). If LMA unsuccessful, consider remaining options, including surgical airway; if patient’s anatomy source of difficult intubation; supraglottic airway contraindicated; consider subglottic options (surgical airway or tracheostomy).
Preoxygenation: With 3 to 5 min tidal volume ventilation, normal patient weighing 70 kg does not become apneic until 8 min have elapsed (ie, patient with functional residual capacity [FRC] of 2.5 L has 2 L of tidal volume). If patient consumes 250 mL O₂/min, oxygen supply lasts 8 min; desaturation faster if patient sick or obese, and in children (have small supply of O₂ to consume); indications for abandoning mask ventilation: failure to allow sufficient time; repeatedly removing and reapplying mask; failure to tighten mask sufficiently (limp bag on anesthesia machine and failure to obtain good exhalation capnogram suggest leak [patient not receiving 100% oxygen]).

Rescue options: employ if intubation and ventilation impossible; request surgical airway; consider attempting Awake intubation: consider if patient has components of difficult airway; patient's acceptance of necessity of awake intubation most important aspect of preparation; next, administer glycopyrrolate to dry airway; administer topical anesthesia; with proper preparation (ie, ensuring "quiet field"), any intubation technique may be used.

1. The first 4 examinations in the ASA Difficult Airway Algorithm require the anesthesia provider to concentrate on the patient’s:
   (A) Mouth and pharynx
   (B) Teeth
   (C) Vocal cords
   (D) Neck and mandibular space

2. A grade 1 view of the airway is defined as the ability to see the:
   (A) Corniculate cartilage
   (B) Arytenoid cartilage
   (C) Vocal cords
   (D) Larynx

3. While attempting to intubate a patient, you find that the mandibular condyle is able to rotate, but it does not translate relative to the temporal bone. The clinical implications are that:
   (A) The patient’s jaw must be manually dislocated forward to allow insertion of the laryngoscope
   (B) The patient will need awake intubation
   (C) The best approach is a surgical airway
   (D) Intubation will probably require 2 people

4. The optimal thyromental distance for facilitating intubation is:
   (A) ≥3 cm
   (B) ≥4 cm
   (C) ≥6 cm
   (D) ≥8 cm

5. Which of the following would be expected to decrease the compliance of the mandibular space?
   (A) Edema
   (B) Cancer
   (C) Scarring
   (D) All the above

6. When checking cervical range of motion during an airway assessment, the ability of the patient to has the greatest priority.
   (A) Perform lateral flexion to 45° bilaterally
   (B) Slightly flex the neck to the chest with the head severely extended
   (C) Perform lateral rotation to 80° bilaterally
   (D) Perform forward flexion to 50°

7. The most important component in preparing for an awake intubation is:
   (A) Assess the length of the patient’s incisors
   (B) Accurately estimate the thyromental distance
   (C) Assess compliance of the mandibular space
   (D) Have the patient accept the necessity of the procedure

8. After 5 min of tidal volume ventilation, a healthy patient who weighs 70 kg and has a functional residual capacity of 2.5 L can go without oxygen for before apnea develops.
   (A) 4 min
   (B) 6 min
   (C) 8 min
   (D) 10 min

9. Preoxygenating a patient in 4 deep breaths over 30 sec saturates the tissues as thoroughly as the traditional method of providing oxygen for 3 to 5 min.
   (A) True
   (B) False

10. It is acceptable to resort to mask ventilation if the laryngeal mask airway with fiberoptic intubation method of intubation fails.
    (A) True
    (B) False

Answers to Audio-Digest Anesthesiology Volume 54, Issue 09: 1-B, 2-D, 3-A, 4-C, 5-B, 6-C, 7-A, 8-A, 9-C, 10-C

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