ANESTHESIA

(4) Part 1 Airway Evaluation and Management

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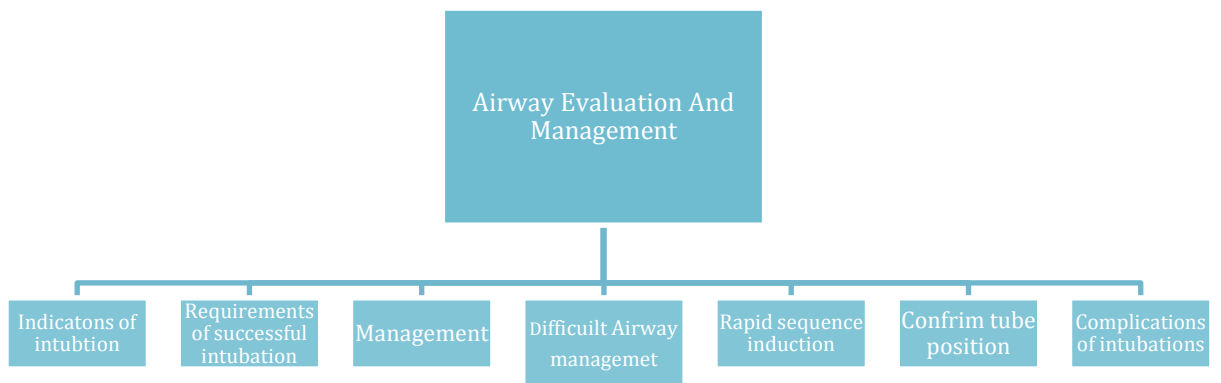Revised by: Mody A. Almarshad

Objectives:

- Learn about basic airway anatomy
- Conduct a preoperative airway assessment
- Identify a potentially difficult airway (Important to understand)
- Understand the issues around aspiration and its prevention
- Learn about the management of airway obstruction
- Become familiar with airway equipment
- Practice airway management skills including bag and mask ventilation, laryngeal mask insertion, endotracheal intubation
- Learn about controlled ventilation and become familiar with ventilatory parameters
- Appreciate the different ways of monitoring oxygenation and ventilation

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                        Airway Evaluation And
                            Management

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  Indicatons of   Requirements   Management   Difficuilt Airway   Rapid sequence   Confrim tube   Complications
  intubtion       of successful              managemet           induction        position       of intubations
                  intubation
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- Resuscitation (CPR). Cardiac arrest.
- Prevention of lung soiling. Aspirating vomit, blood, or pus if it's in one of the lungs then you want to prevent it from spreading to the other, so you put double long tube isolate it.
- Positive pressure ventilation (GA). For example in a patient who is morbidly obese you want to get the maximum benefit from his lungs if you are going to put him under general anesthesia, and by PPV you cause alveoli recruitment which is the usage of all alveoli. Normally we don't use all our alveoli when breathing.
- Pulmonary toilet or pulmonary hygiene: a set of methods used to clear mucus and secretions from airways. Done for patients with mucocilliary dysfunction by any cause. They do it every 6 months in OR.
- Patent airway (coma or near coma). Patient comatose, GCS less than 8. To maintain patent airways.
- Respiratory failure(CO2 retention) due to COPD, bronchiectasis, central respiratory failure..etc.

Why do you need to intubate?

❖ To prevent aspiration. Because oxygenation here isn't the issue, you can ventilate through mask and maintain his oxygenation, however there's a chance for aspiration, so you intubate him.

❖ Other reasons to intubate:

Hypoxemia despite of oxygenation
Anesthesia- undergoing surgeries which require intubation like laparoscopy (because they inflate the abdomen and there is a risk of aspiration) or if the patient doesn't want to go regional anesthesia, so you must intubate him for general anesthesia.

1-Normal roomy mandible
Normal distance is 3 fingers unlike in receding mandible. And some patients have normal mandible but when they lie it becomes receded.
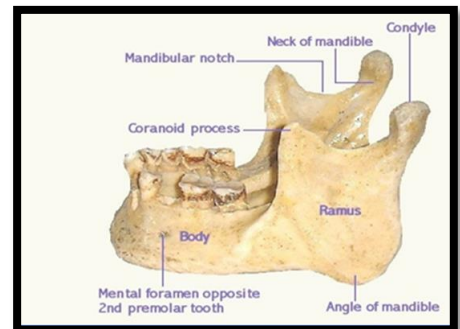
2-Normal T-M (temporo-mandibular), A-O (atlanto-occipital), and C-spine

-Any anomaly in these 3 joints
A-O, T-M or C-spine can result
In difficult intubation. For example Abnormal temporo-mandibular seen in Rheumatoid arthritis, joint lock..etc

3-Alignment of 3 axes or
Assuming sniffing position

❖ Ideally: you extend the head and lift the chin trying to get all these imaginary lines aligned in sniffing position

❖ The alignment of the 3 lines is ideal and hardly found.
1st line: oral axis, a drawn line from the mouth perpendicular to the occiput.
2nd line: pharyngeal axis, line is parallel to Pharynx.
3rd line: laryngeal axis, line parallel to larynx.
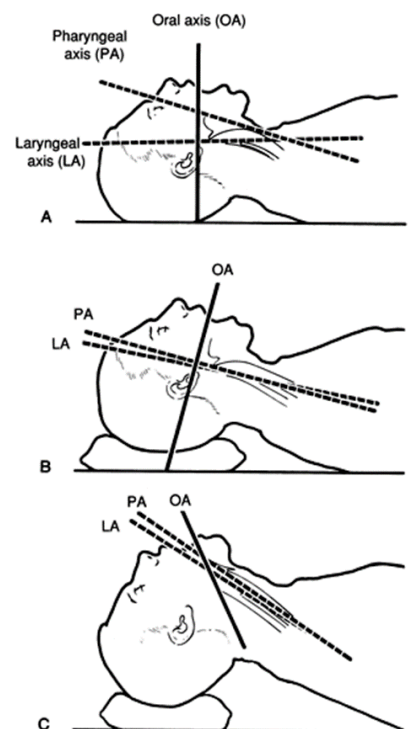
4-Proper equipment
- Bag and mask,oxygen source
- Airways oro and nasopharyngeal
- Laryngosopes different blades
- ETT different sizes
- Suction

Lecture Title
Anesthesia Teamwork 432

4

I-History:
- Previous history of difficulty is the best predictor

Inquire about:
-Nature of difficulty. What was the hard part? Mask ventilation, intubation, extubation?
-No of trials by experienced anesthetists and the ability to ventilate between the trials, if it was easy or hard.
-Ability to ventilate versus trials
-Maneuver used. Repositioning, chin left, shoulder roll placed under shoulder for better alignment.
-Complications. Traumatized vocal cords by previous intubation.

- Snoring and sleep apnea (predictors of DMV)

Sleep apnea: cessation of breathing during sleep and fatigability during day because of lack of sleep. Future complications: right side heart failure and pulmonary HTN.
Snoring: ask the spouse. People who snores they either have apnea, large adenoid, or their larynx is fluffy so once you give them muscle relaxant they'll collapse.

- ❖ If the intubation was difficult and you couldn't intubate, you start ventilating the patient. If you accomplished the ventilation you saved his/her life and problem is solved, wake him up and do fibrooptic later.
- ❖ If you Couldn't intubate nor ventilate the solution is surgical, cricothyrodotomy or tracheostomy.

II-Examination

<u>I-Inspection</u>
Look for any obvious anomaly
Morbid obesity(BMI>40) (short neck)
Skull
Face
Jaw (ginatisim or any abnormality)
Mouth,teeth
Neck (short neck)

Fig 7

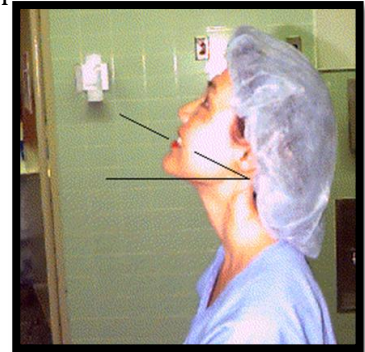Notice any anomalies most important the syndromes (Marfan, down syndrome..etc) goiter, acromegaly, abscess, swellings.

II- Examine:
I- The 3 joints movements:
- A-O joint(15-20 degrees). Presence of a gap bet the Occiput and C1 is essential. Head movement
- The cervical spine(range>90) Neck movement
- T.M joint:
 -interdental gap(pts 3 fingers)

  -subluxation (1 finger)

- ❖ Subluxation of the atlantooccipital joint seen in down syndrome (50% and asymptomatic) and patients after trauma.
- ❖ The type of subluxation in rheumatoid patients is posterior while in other conditions mostly anterior.

II- Measurements of the mandible
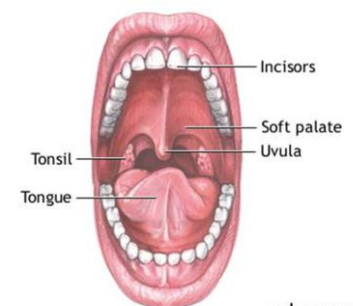-Thyro-mental distance (head extended)
   Normally 6.5 cm
   Less than 6 cm=expect difficulty

Thyromental Distance

Norm: 6.5 cm
Concern: < 6 cm
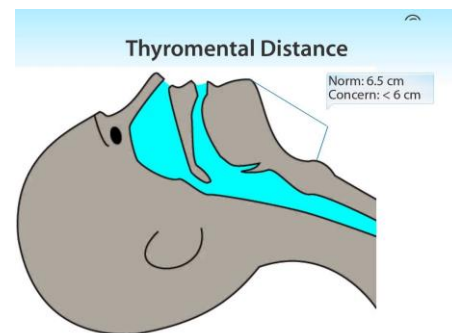
III- Tests to predict difficulty
 I-Mallampatti test:
Based on the hypothesis that when the base of the tongue is disproportionally large it will overshadow the larynx (MCQ)

Incisors
Soft palate
Uvula
Tonsil
Tongue
adam.com

Simple easy test, correlates with what is seen during laryngoscopy or Cormack-Lehene grades, but
1-moderate sensitivity and specificity (12% false +ve)
2-Inter observer variation
3-Phonation increases false negative view

❖ It's changeable not fixed and precise, sometimes with manipulation 3 becomes 2 and sometimes with anesthesia 2 becomes four and phonation changes the score from 3 to 2.
❖ It predicts 50% of difficult intubations

II-Wilson Test

Consists of 5 easily assessed factors:
Body wight (n=0 ,>90=1,>110=2) if normal=0, if slightly =1, Extensively=2
Head and neck movement
Jaw movement
Receding jaw
Buck teeth
Each factor assigned as o ,1 ,2 max is 10.

Difficult airway

- **Expected from history, examination:** Secure airway while awake under local anesthesia and use fiberoptic.
- **Unexpected:** Different options, but the priority for maintenance of patent airway and oxygenation
- ❖ **Expected difficult intubation case:**

Patient is pregnant, with 3 previous C-sections, can't go for vaginal delivery. Electively booked for C-section tomorrow. Her history: previous intubation was difficult, Mallampati score: 4, goiter.

1st you offer her spinal or epidural, but patient tells you she developed DVT and she has hypercoagulable state and on anticoagulant. Or else she'll develop spinal hematoma.

Came to ER at night in labor. Right away you **insert fiberoptic laryngoscope** under local anesthesia –no GA- (mother is priority over fetus) give premeds to decrease salivation, in sitting position. Then after the tube is in and airways are patent you give GA for her C-section.

- ❖ **Unexpected difficult intubation case:**

Patient with Mallampati score 1.
In OR you put him under general anesthesia then couldn't intubate.
What do you do?

1ˢᵗ Try to ventilate using the mask and if it worked (saved his life)
Then or **switch to other tubes bougie, glidescope, or LMA** to facilitate the intubation or ask for help or wake him up and replan. If none worked do cricothyroidotomy.
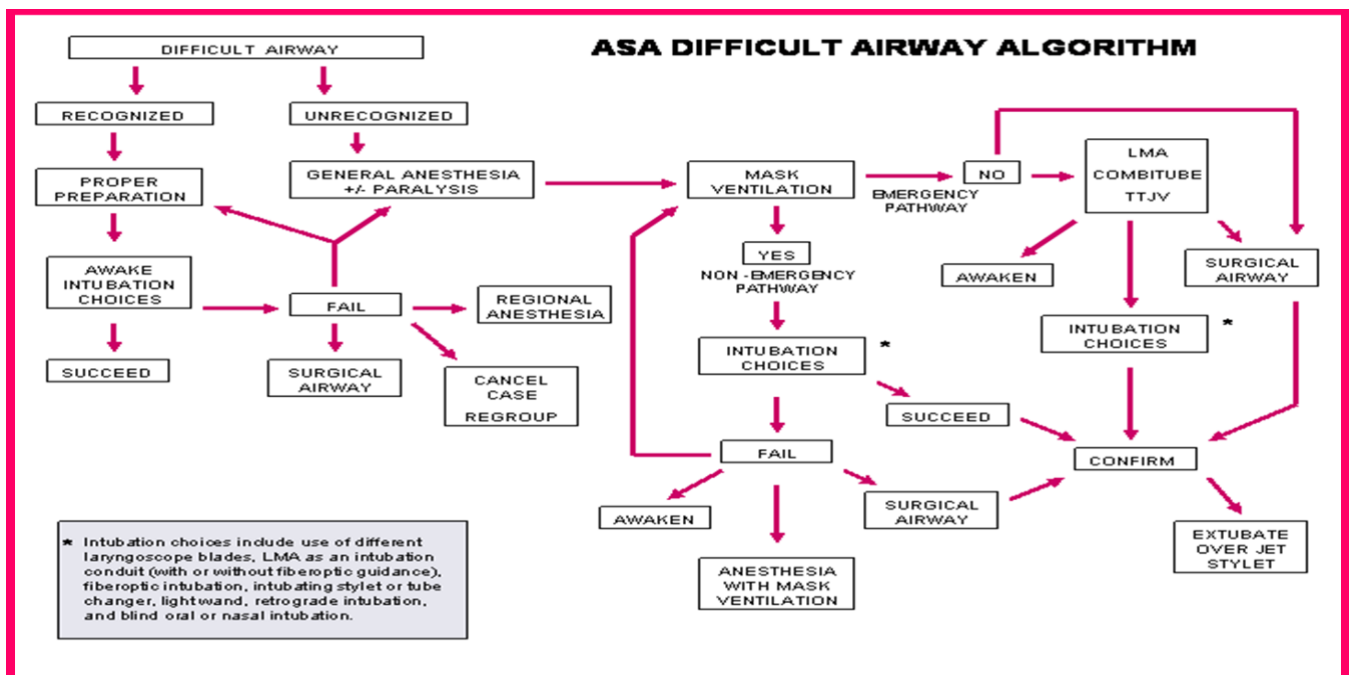
❖ **In expected difficult intubation:**

You go For other methods than ETT, you either do glidescope or fiberoptic under direct vision, you see the vocal cords and see if there are any masses or anything that prevents the tube from going forward and if it's compressing the airway, for that you use rigid bronchoscope.

❖ In unexpected emergency situations when the intubation and the ventilations aren't accomplished, you do **cricothyroidotomy**

Tracheostomy can be done but not in C-sec, done for: cervical fracture fixation, long procedure, going to ICU.

You can check the updated algorithm however the doctor explained on this. You are not required to know it.

In expected difficult intubation you don't give muscle relaxant. The most imp point to maintain spontaneous breathing so you can wake the pt easily if the intubation plan changed or didn't work. If you gave the pt muscle relaxant she/he won't wake up till after the muscle relaxant effect fades away and it'll

take time. You only give local anesthesia (lidocaine) and give medication to reduce the salivation and insert fiberoptic.

Explaining the algorithm in brief:

Difficult airway:
If recognized:
1)proper prep (prepare difficult airway trolley, multiple LMAs multiple tubes sizes and types, fiberoptic) or decide from the beginning on fiberoptic (awake intubation).
If failed you have 3 options:
1) Awake the patient and tell her you'll go for regional putting in mind that GA always plan B. You might do regional and then she collapses so you have to intubate
2) Cancel case and regroup for another time (prepare everything from rigid bronchoscope, ENT for urgent tracheostomy ..)
3) Surgical airway: if you can't ventilate nor intubate>> tracheostomy,cricothyroidotomy.
4) If awake intubation failed bold anesthetists go for GA.

If airway unrecognized and you gave GA (+-become paralyzed by muscle relaxant) before you find out.

1) you check if ventilation is easy or not if easy >> pick one of the intubation choices if failed: either awake, or keep anesthesia with holding the mask for ventilating the patient without tube or LMA or anything (very easy in pediatrics), or surgical if mask failed not easy go for tracheostomy, or cricothyroidotmy.

If mask ventilation from the start wasn't easy (and intubation was not easy) it's
<u>EMERGENCY</u>:
1st try to use LMA if mask was difficult. But if the type of surgery requires tube like laparoscopy (high risk of Aspiration) can't use LMA:
1) Wake him up and replan
2) Put surgical airway if emergency and LMA failed
3) Other intubations: rigid bronchoscope (if LMA worked),fiberoptic,.. etc

❖ Airway gadgets

❖ Needle Cricothyroidotomy
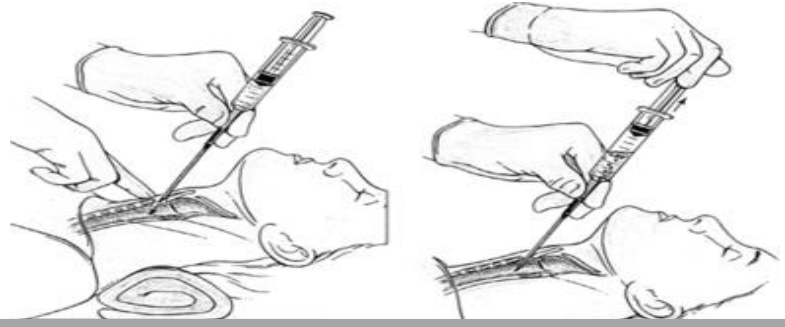
- **Direct visualization of ETT between cords** (best confirmatory method)
- Bronchoscopy; carina seen (if you wanted to make sure you use the bronchoscope with camera and check)
- Continuous trace of capnography (End tidal co2)
- 3 point auscultation
- Esophageal detector device (changes its colour from yellow to purple if detected co2. it's temporary, used in ER mostly)
- Other as bilateral chest movement, mist in the tube, CXR

❖ Case: you inserted the tube, haven't seen the other signs except for end tidal co2 but then it disappeared >>> indicates esophageal intubation.
You must see 6 waves regular and identical if flickering then you are not in the right place.

❖ Direct vision is enough if you are not sure you can do them all or it depends on the situation

Rapid sequence induction

- **Indications:**

1)emergency cases: all trauma patients considered full stomach, even if they denied eating anything, cause with the shock state the gastric emptying =0 and he'll aspirate his gastric secretions.
2)patients at risk of aspiration: GERD, any cases with increased intra-abdominal pressure that can lead to back flow and aspiration: pregnancy, very big ovarian cancer

- **Technique:**

-Preoxygenation (cause you won't ventilate so you need good reservoir of O2 in the lungs)
-IV induction with sux or modified recornium (don't give cistraconeum)
-Cricoid pressure
-Intubate, inflate the cuff, and confirm position
-Release cricoid and fix the tube

❖ Cricoid pressure is done after induction not while the patient is awake cause it's disturbing.Don't press strong cause it'll make the intubation harder.
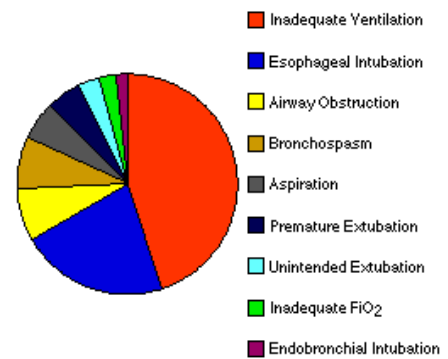
❖ Sux and modified R is only for RSI. Situations where sux is contraindicated: renal failure and K is 7 (sux causes hyperkalemia) >>> instead of sux you use modified recornium.

Complications of intubation

1-Inadequate ventilation
2-Esophageal intubation
3-Airway obstruction
4-Bronchospasm in asthmatics
5-Aspiration
6- Trauma
7-Stress response (HTN)

❖ Others:

-Brady-arrhythmias due to vagal stimulation
-Hypertension
-Traumatizing the patient by the laryngoscope: teeth, vocal cords,..
-Immediate complication of the tube: esophageal intubation, aspiration, bronchus intubation, obstruction

- Inadequate Ventilation
- Esophageal Intubation
- Airway Obstruction
- Bronchospasm
- Aspiration
- Premature Extubation
- Unintended Extubation
- Inadequate FiO_2
- Endobronchial Intubation

Recommendations

- Adequate airway assessment to pick up expected D.A (difficult airway) to be secured awake
- Difficult intubation cart always ready
- Pre oxygenation as a routine
- Maintenance of oxygenation not the intubation should be your aim
- Use the technique you are familiar with
- Always have plan B,C,D in unexpected D.A

Summary

- **Requirements of successful intubation:**
1) **Normal roomy mandible**
2) **Normal T-M, A-O, and C-spine**
3) **Alignment of 3 axes or**
4) **Assuming sniffing position**
5) **proper equipment**

- **Before intubation you must do pre-airway assessment which consist of:**
1) **History taking**
2) **Examination (general,3 joints, specific tests-Mallempati and Wilson)**

- **Difficult airway:**

Expected: from history, examination secure airway while awake under local anesthesia and use fiberoptic
Unexpected: Different options, but the priority for maintenance of patent airway and oxygenation

- **The only drugs used in RSI are Sux and if it's contraindicated like in renal failure cases use modified recornium.**
- **Direct visualization of ETT between cords (best confirmatory method of tube position)**
- **Maintenance of oxygenation not the intubation should be your aim**

MCQ's :

Q1.Patient with mallempati score 1, has no dysmorphic features or any swellings. He is undergoing GA. What's the next step?

A)Intubate the patient by ETT   B) Preoxygenation   C) Induce the drugs

Q2.The patient has a beard, you faced some difficulty in placing the mask. What's your next step?

A)Shave his beard   B) Use glidescope   C) LMA

Q3.A full term pregnant women in labor is going for C-section, requested general anesthesia. Which of following will you avoid?

A) Preoxygenation   B) Apply cricoid pressure   C)Ventilate the patient after drug induction

B-C-C