

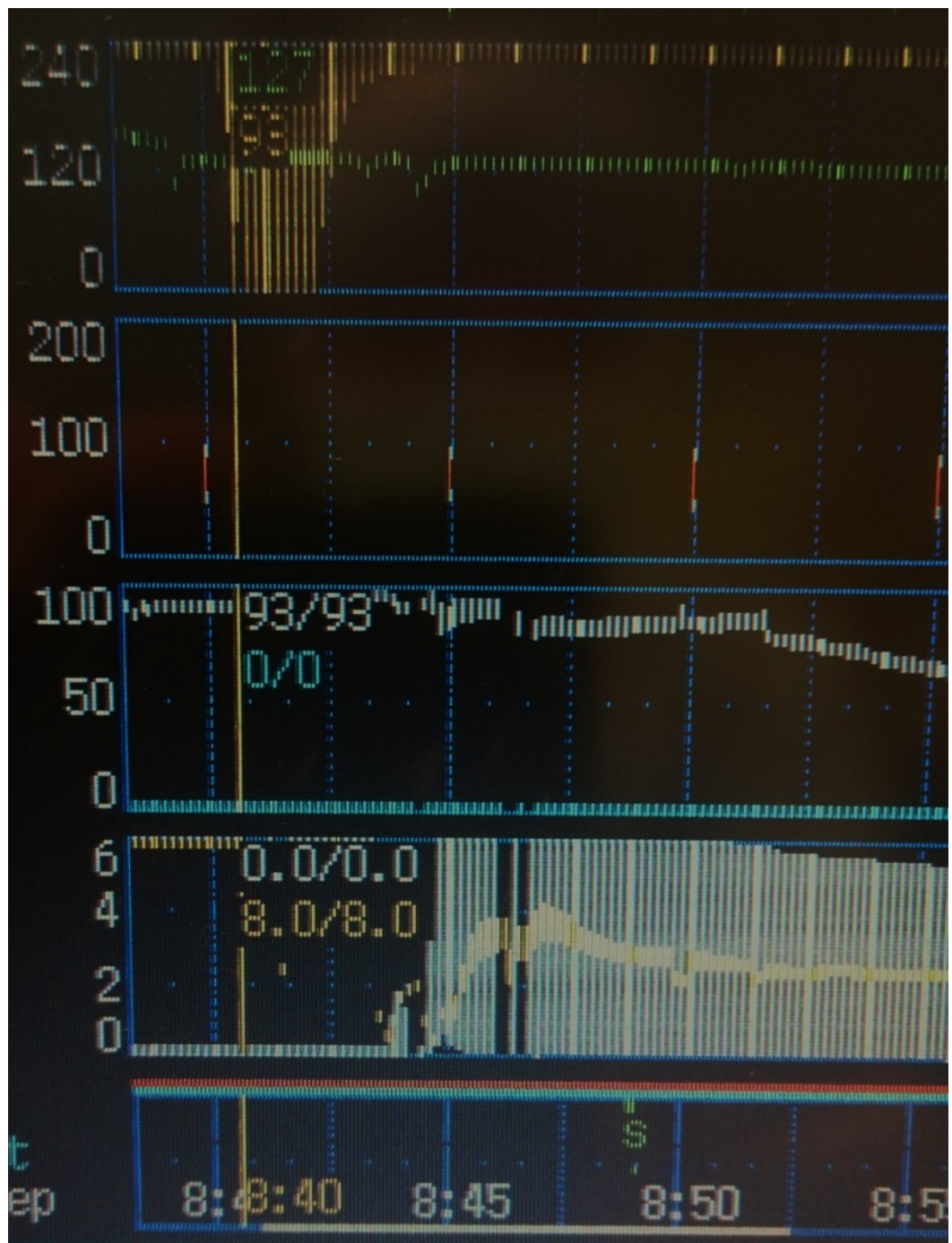


**AIRWAY**

# *Airway management*

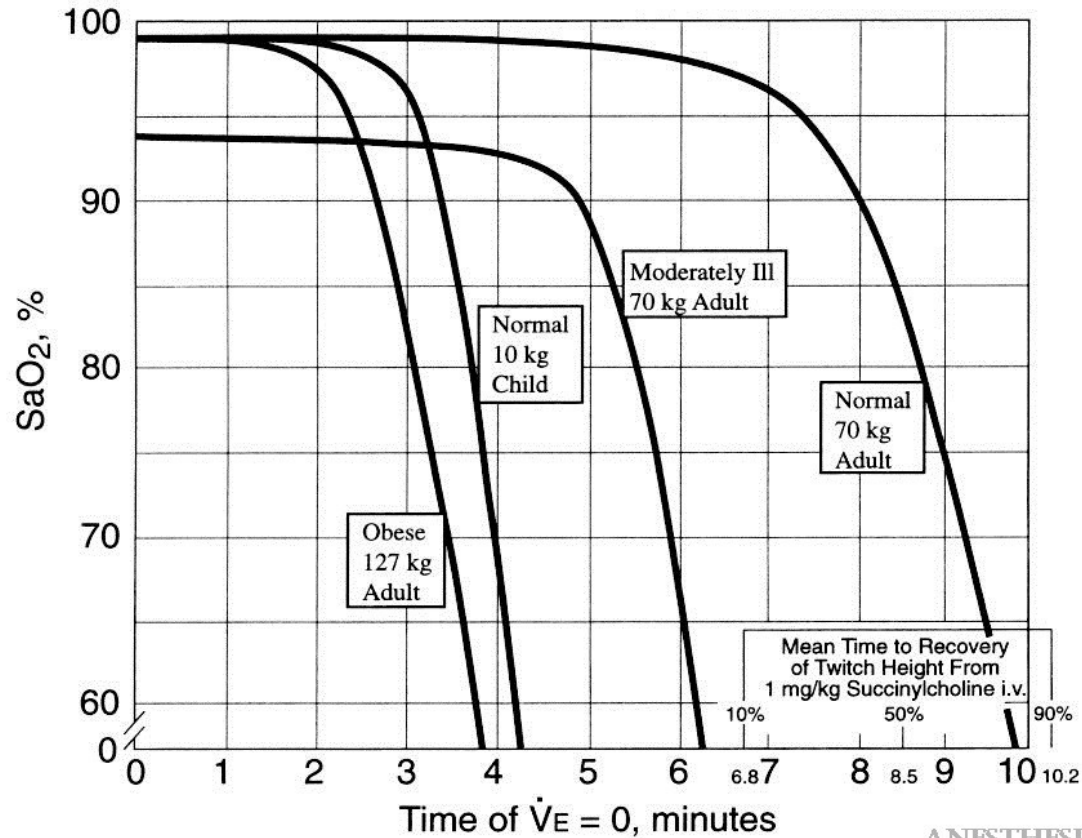


Lukáš Dadák  
ARK FNUSA



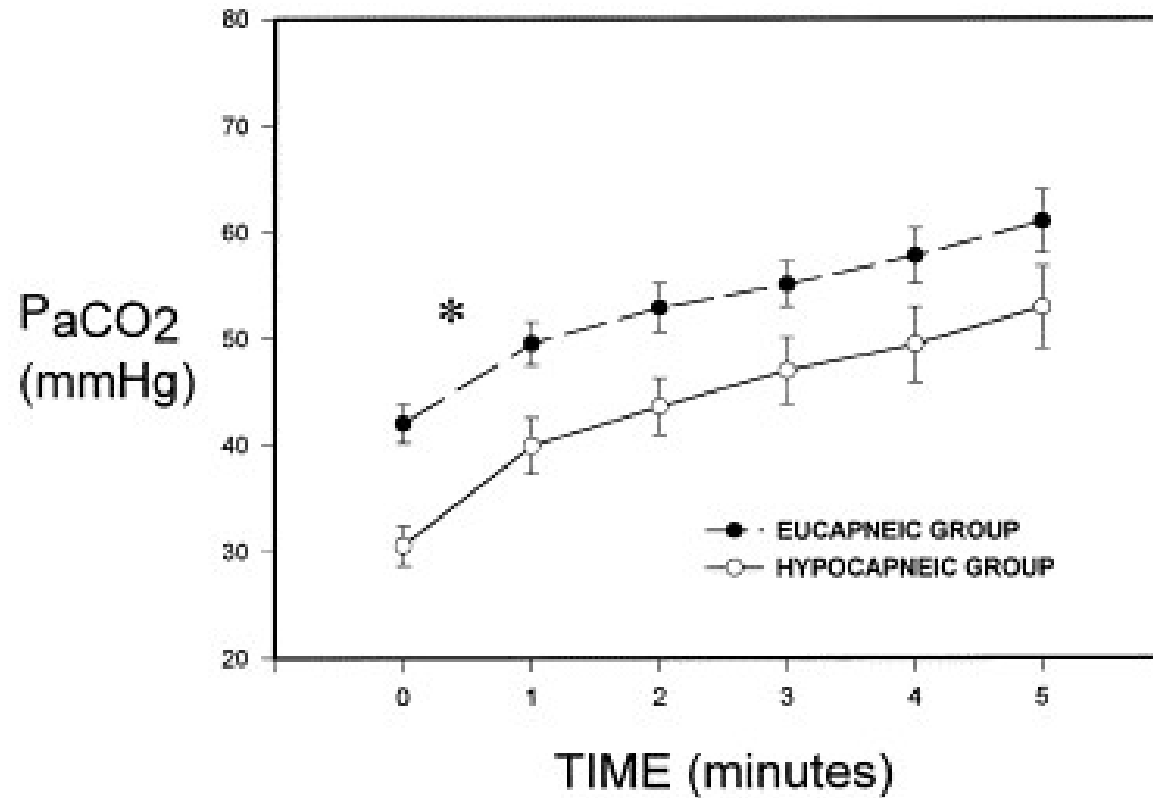
# Desaturation

TIME TO HEMOGLOBIN DESATURATION WITH INITIAL  $F_{A}O_2 = 0.87$



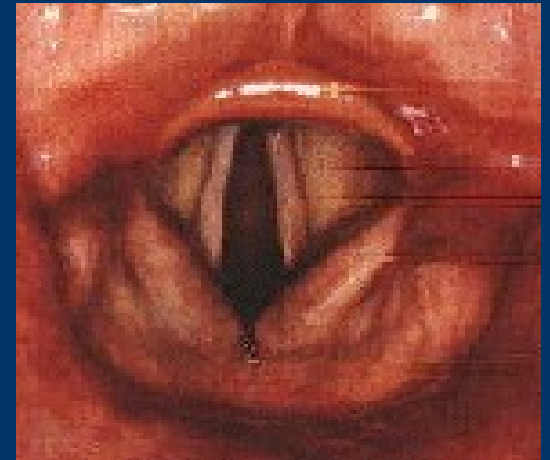
Benumof, J. L. et al. Critical Hemoglobin Desaturation Will Occur before Return to an Unparalyzed State following 1 mg/kg Intravenous Succinylcholine. *Anesthesiology*. 87(4):979-982, 1997.

# Apnoe and CO<sub>2</sub>



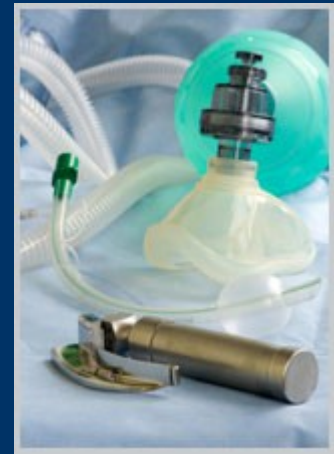
## *Maintaining airway*

- Noninvasive
  - airway
  - laryngeal mask
  - combitube
- invasive
  - OTI, NTI
  - coniotomy
  - tracheotomy



vocal  
cords

# *Routine Airway Management*



- Mask 1 2 3 4 5
- LM 1 1,5 2 2,5 3 4 5
- OTI 3 3,5 4 4,5 ... 7 7,5 8 8,5 9
  
- FONA
  - Front of Neck Access
  - scalpel-bougie-tube

# Airway Management

---

THE



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# 3 + 1 ways

how to keep / improve

oxygenation O<sub>2</sub>

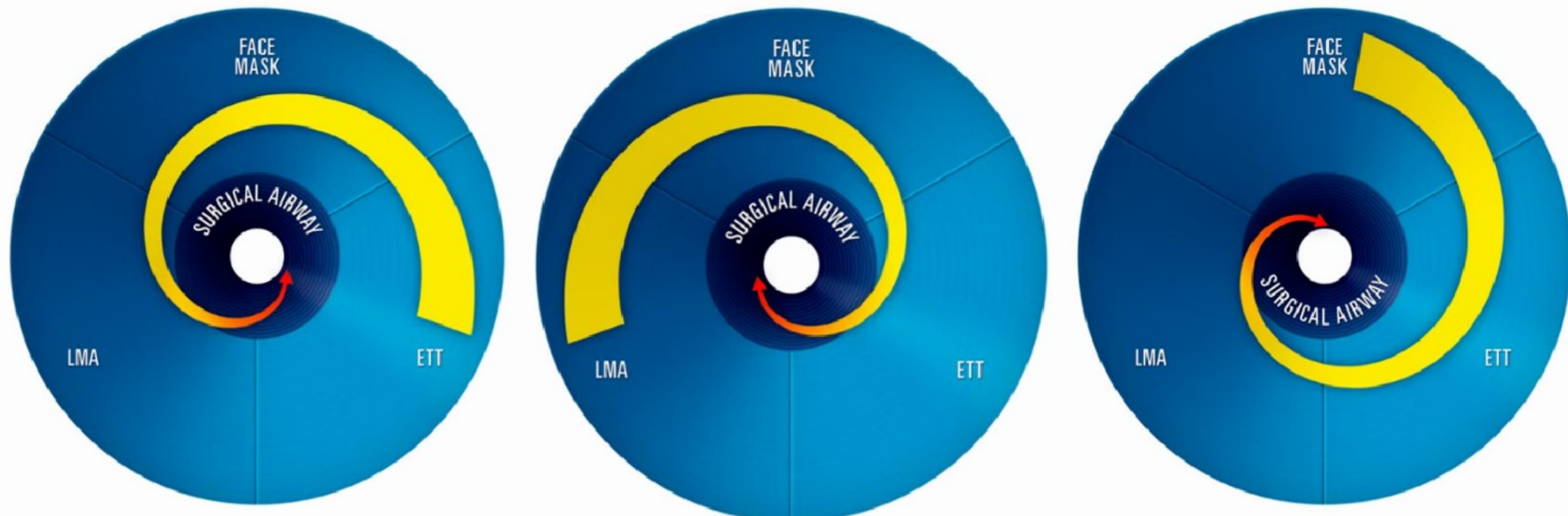
ventilation CO<sub>2</sub>



3 + 1 ways



# Diferent situations of Airway Management



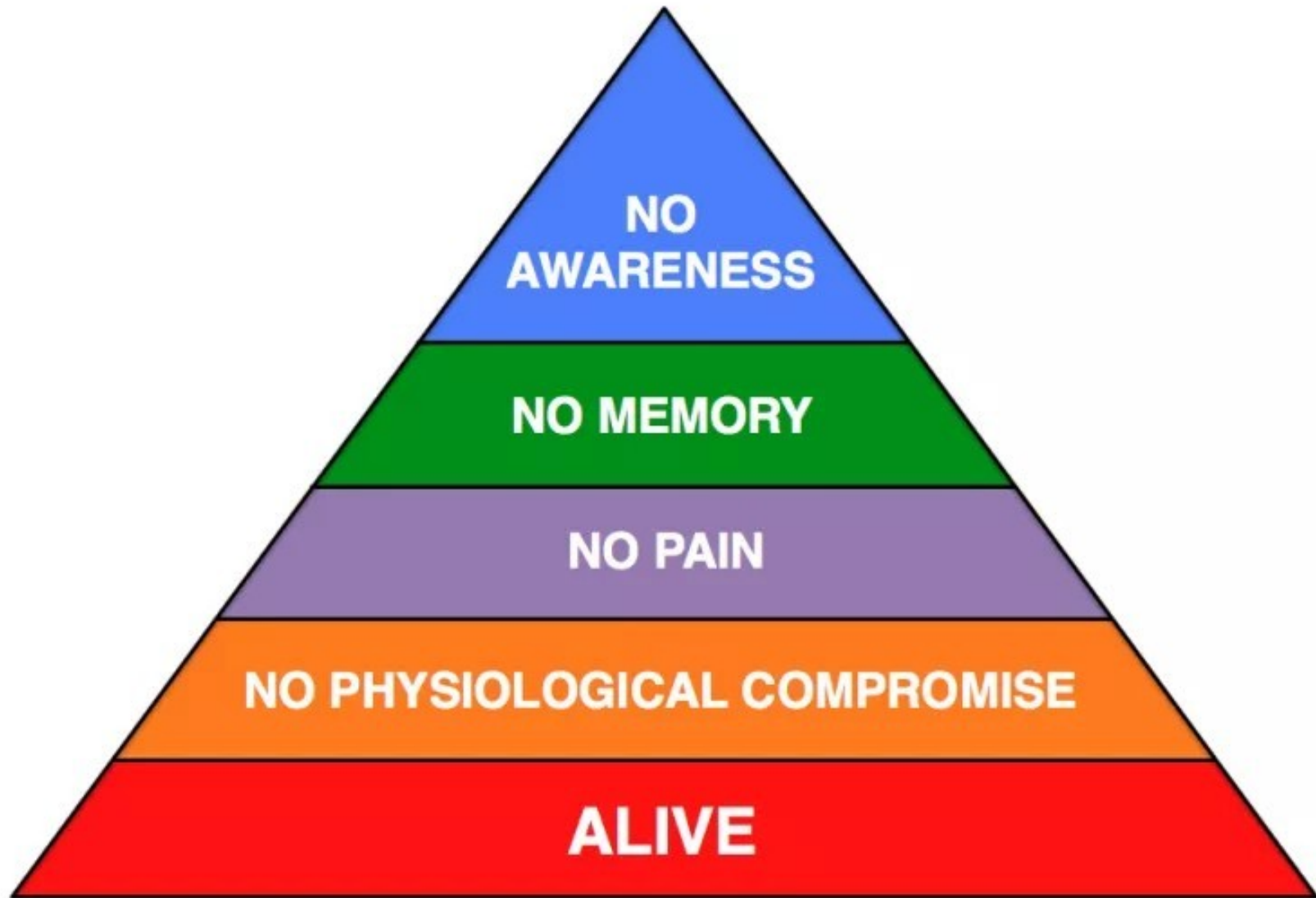
# Goal: Green zone

O<sub>2</sub>

CO<sub>2</sub>

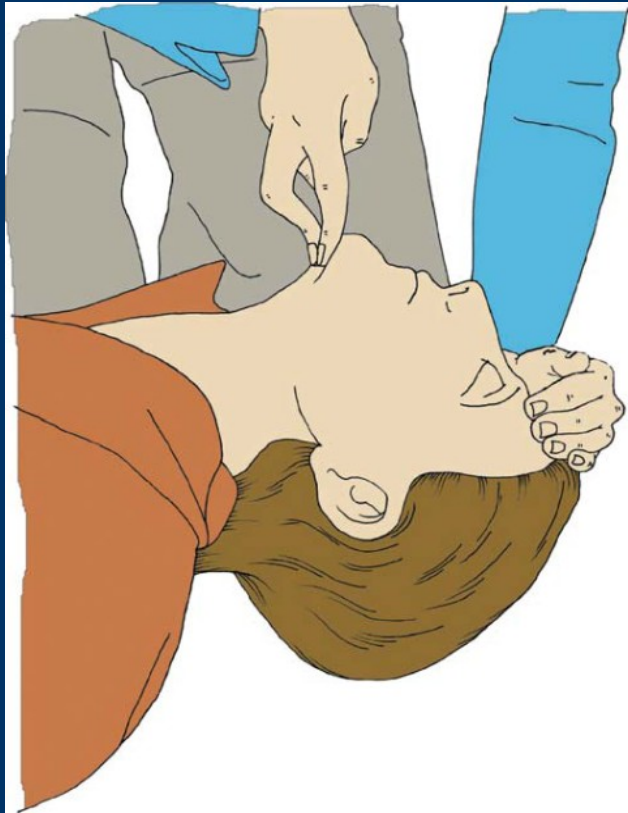


# Priorities of (D)AM

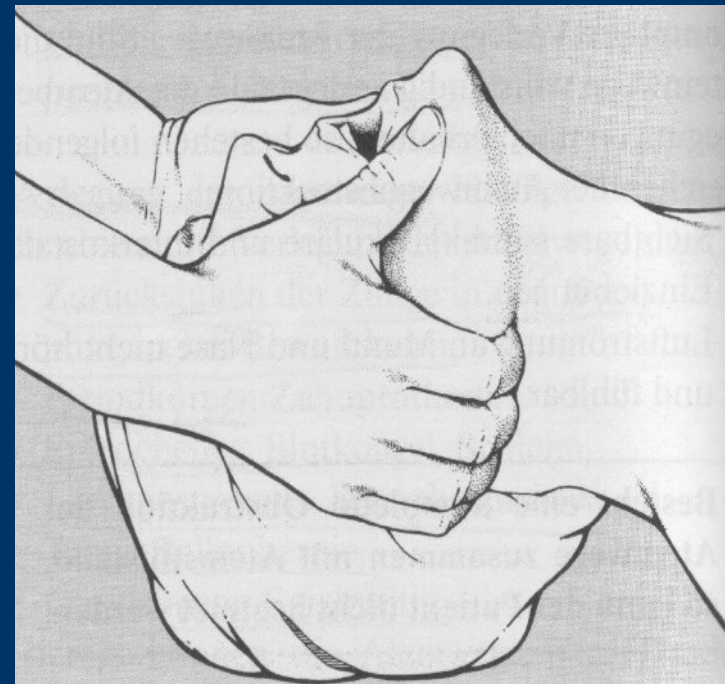


# *Keep airway open*

haed tilt, chin lift



Esmarch man.



# Face mask ventilation

Positive pressure ventilation by bag-valve mask



- correct volume = movement of chest
- f 10/min
- 100% O<sub>2</sub>
- 1 hand hold:
  - inch + index f.
  - 3 ff. - chin
- 2 hands

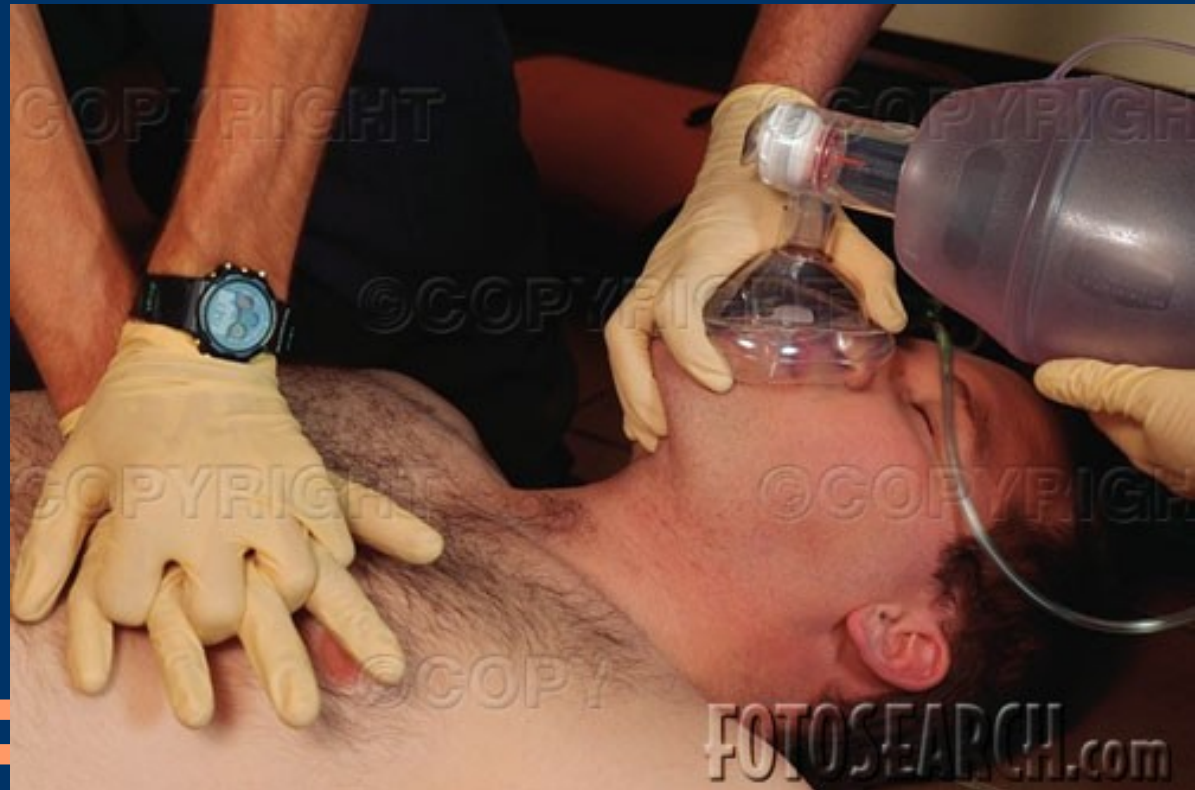




Figure 42-4 Technique for holding the mask with one hand. An effort should be made to avoid excessive pressure on the soft tissues of the neck.



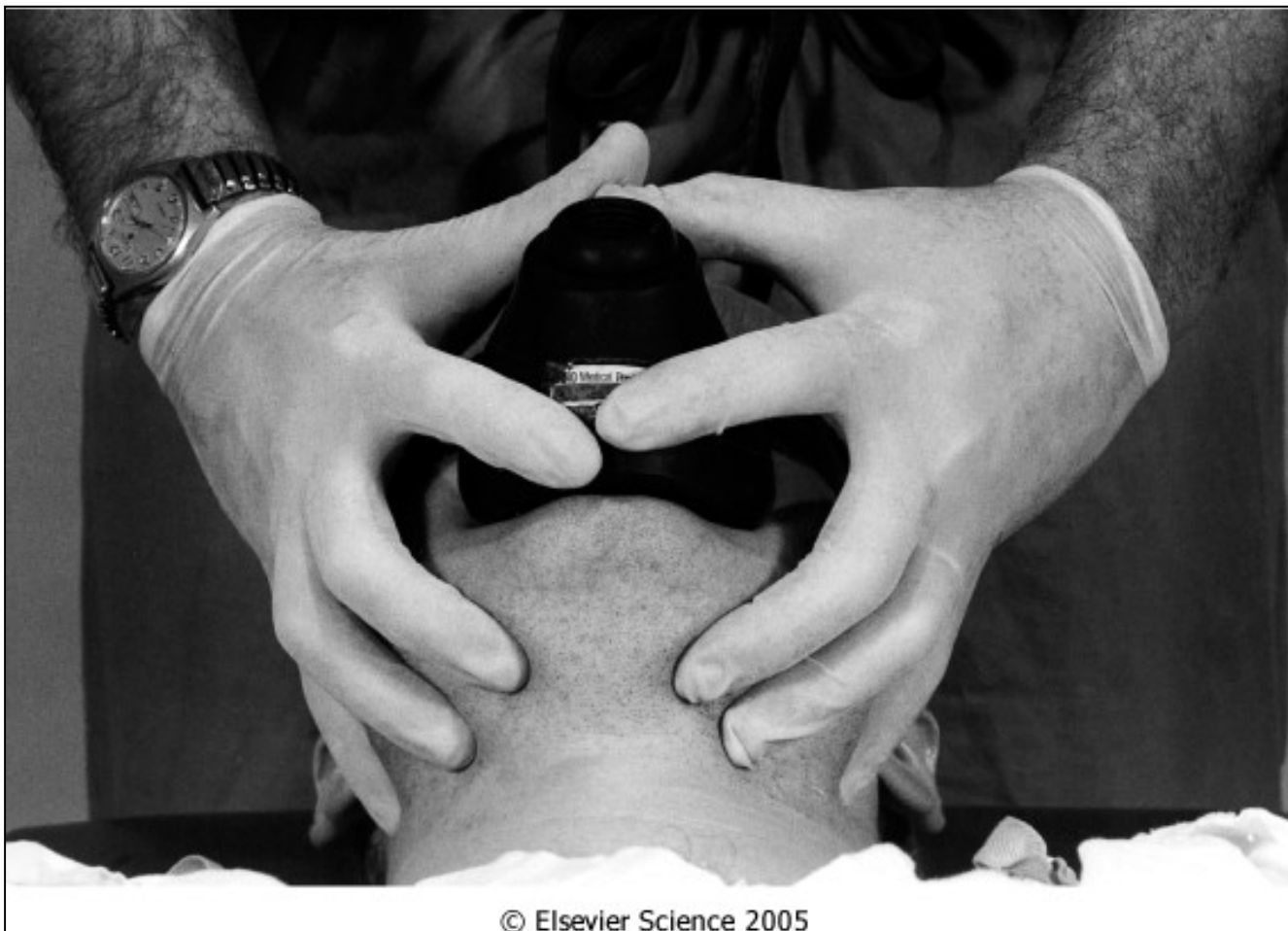
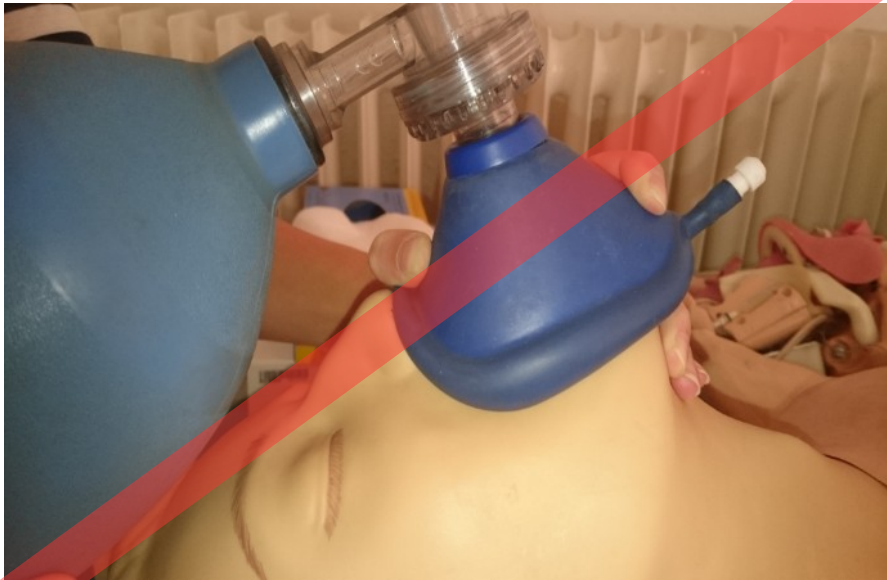


Figure 42-6 Technique for holding the mask with two hands.

# 3rd year Airway management



# Do NOT



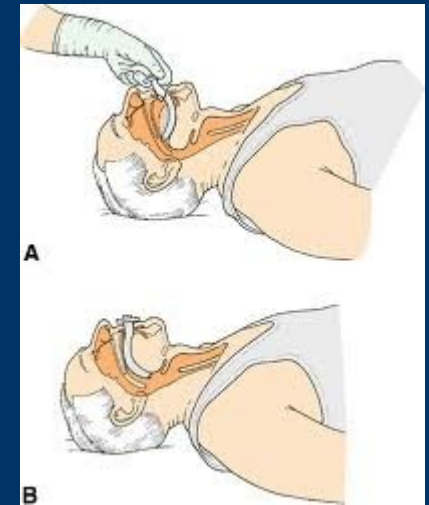
# 4 Hands Ventilation



# *(Bag) Mask Ventilation*

Improved by

- OPA



# Guedel airway Oro-Pharyngeal Airway



I: unconsciousness  
+ airway obstruction with tongue

Correct size OPA:

- distance angle of mouth --- ear

Risk in mild unconsciousness:

- vomitus + aspiration



# *Naso-Pharyngeal Airway (trumpet)*



Correct size of NPA:

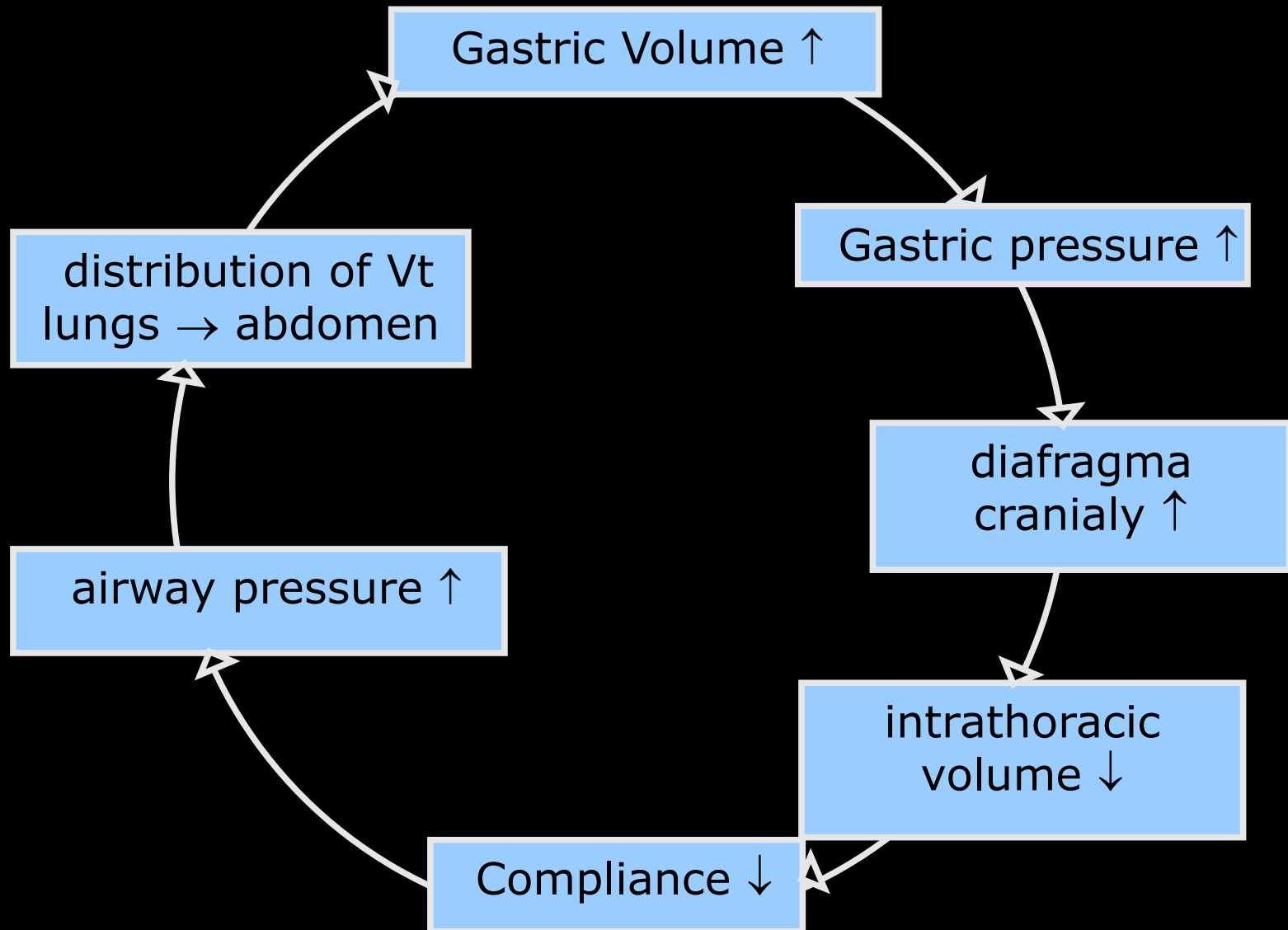
- distance nostril --- ear

Risk:

- bleeding from nasal cavity
  
- Use of lubricant is essential

# Difficult Airway

## difficult mask ventilation





# Unexpected DAM in OR

Induction



Facemask ventilation

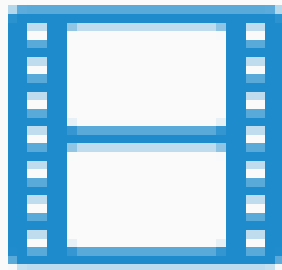
Scenario 1

Ventilation/Oxygenation (V/O)



Impossible

And NOW?



# Unexpected DAM in OR

Call for HELP

Induction

Facemask ventilation

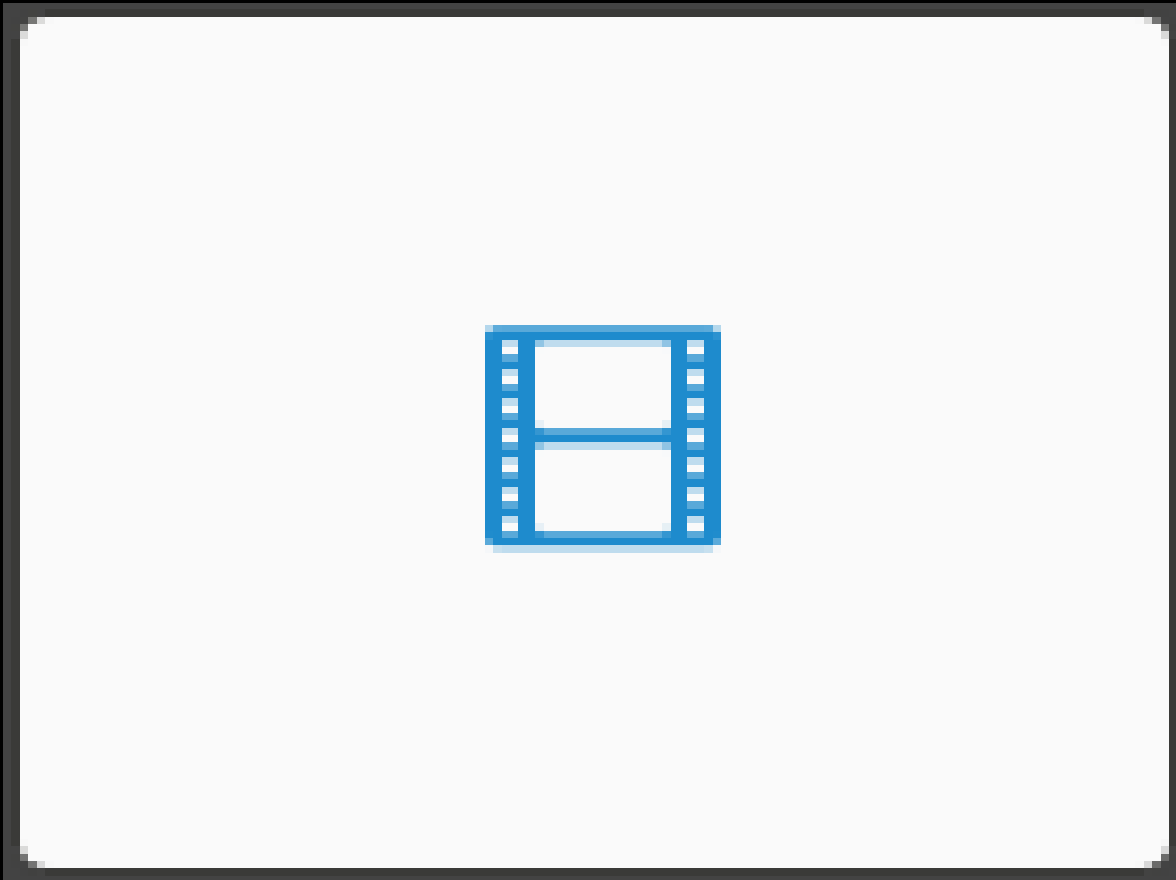
Scenario 1

Ventilation/Oxygenation (V/O)

Impossible

Step 1

**Rescue V/O**  
**LMA Supreme, ProSeal ...**



3 + 1 ways

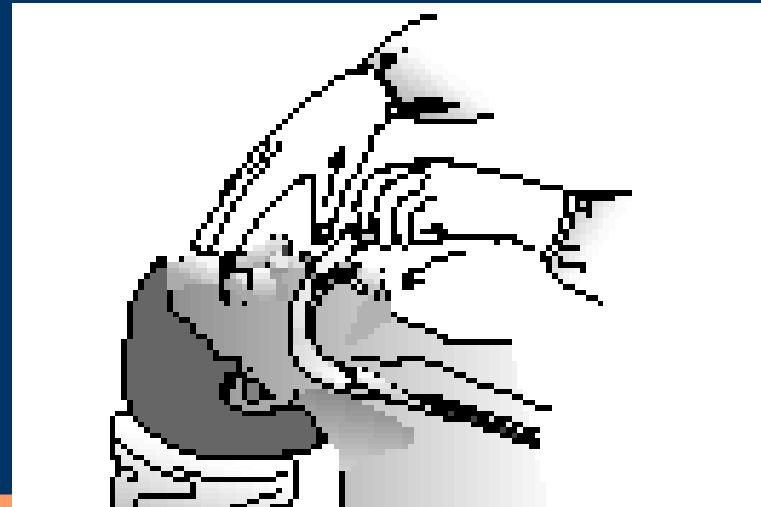


# *Supraglottic devices:*

- LM
- (( Combitube ))
- (Laryngeal tubus)
- I-gel



# *LM Classic, ProSeal*



Single-use  
LMA Flexible

Single-use  
LMA Unique

Single-use  
LMA Fastrach

LMA Flexible

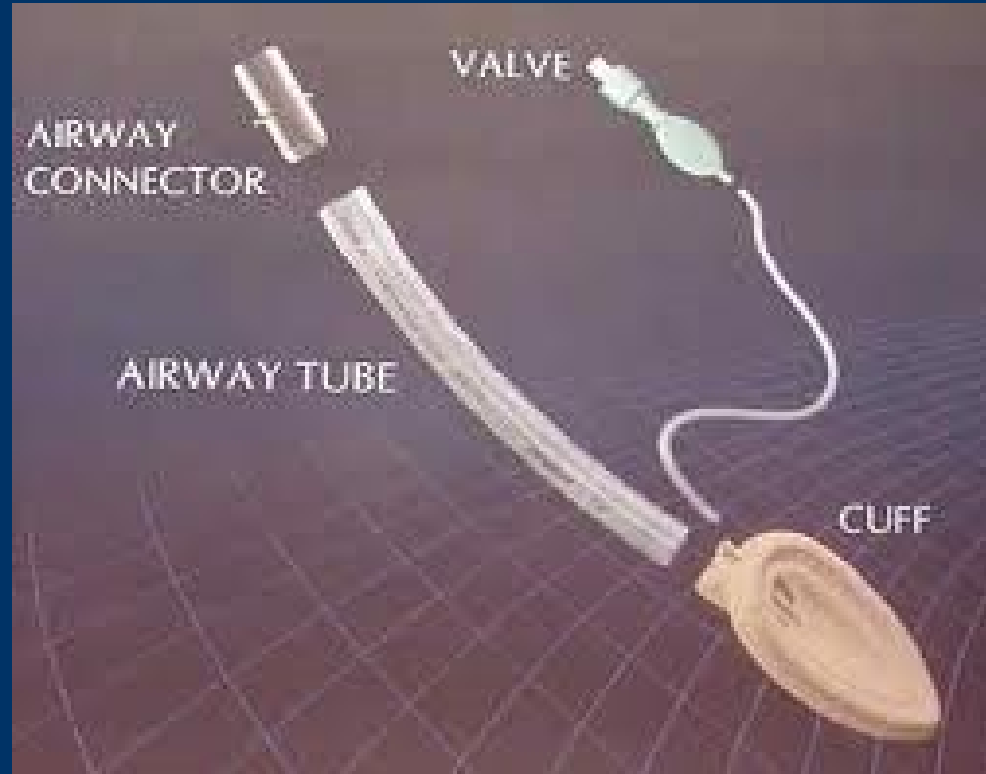
LMA ProSeal

LMA Classic

LMA Fastrach



# *Components of LM*



## *LM*

placed against glottis (radix of tongue, recessus piriformis, esophageal superior sphincter)

I: instead face mask, OTI, difficult airway

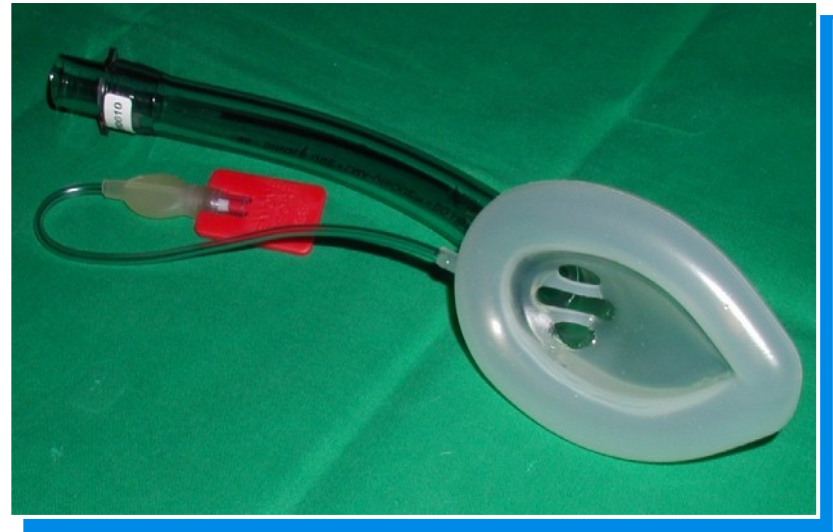
CI:

- full stomach
  - gastro-esophageal reflux,
  - high inspiratory pressure
  - longer operation
- 
-



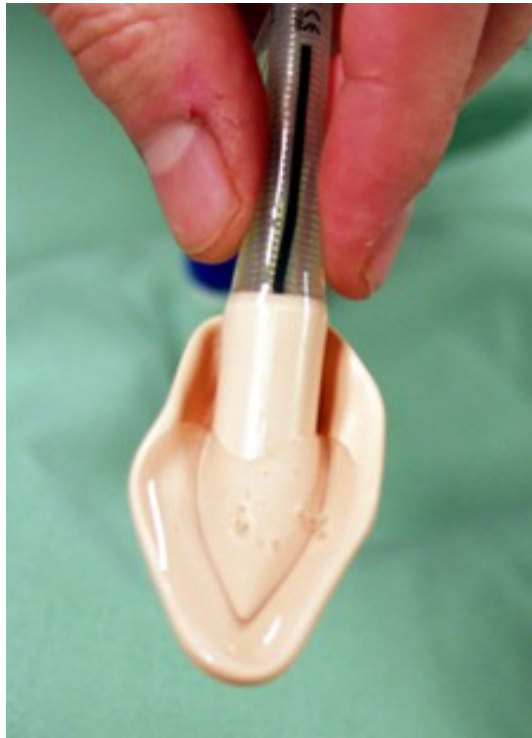
# LM

- LMA Classic = reusable 40 times
- LMA Unique Single use

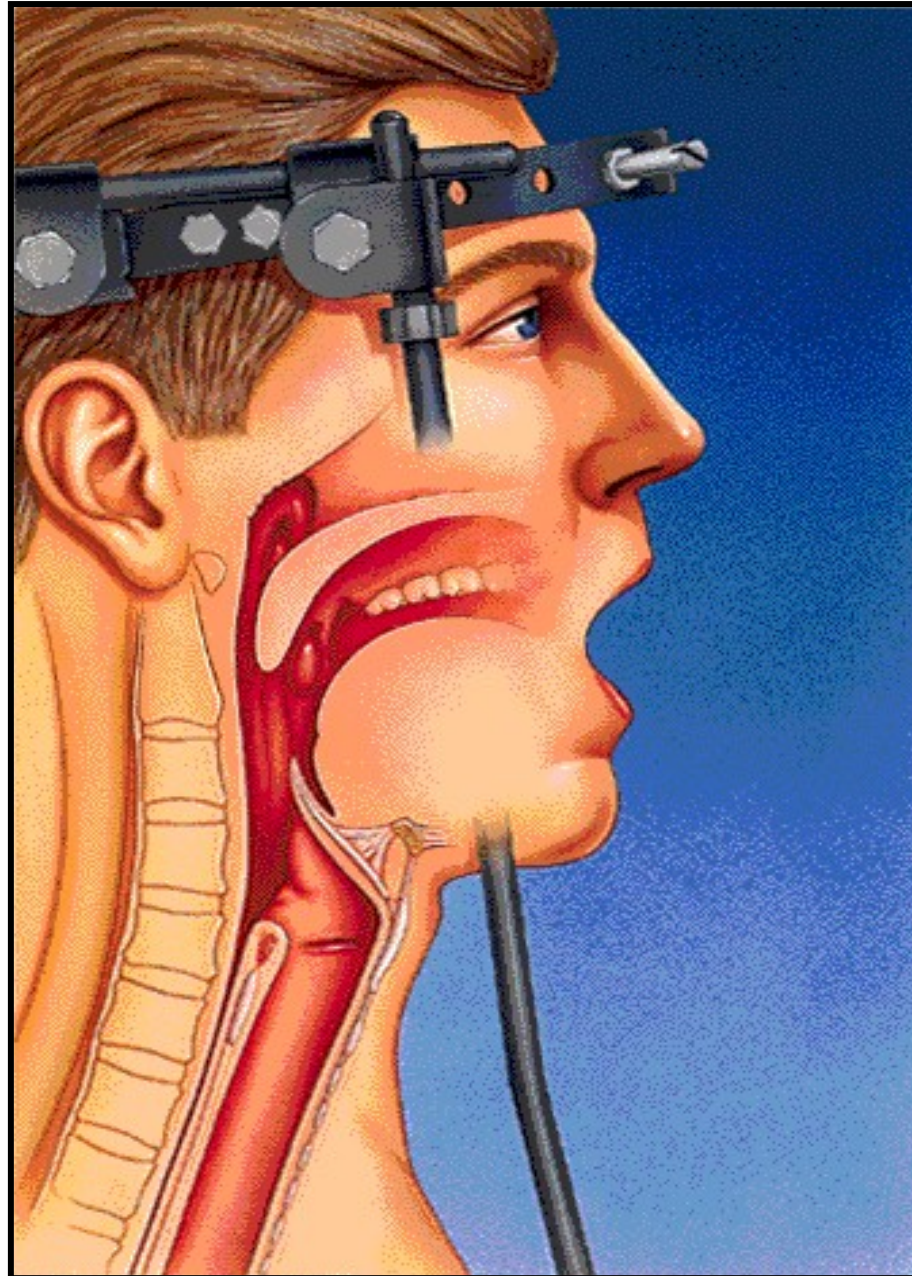


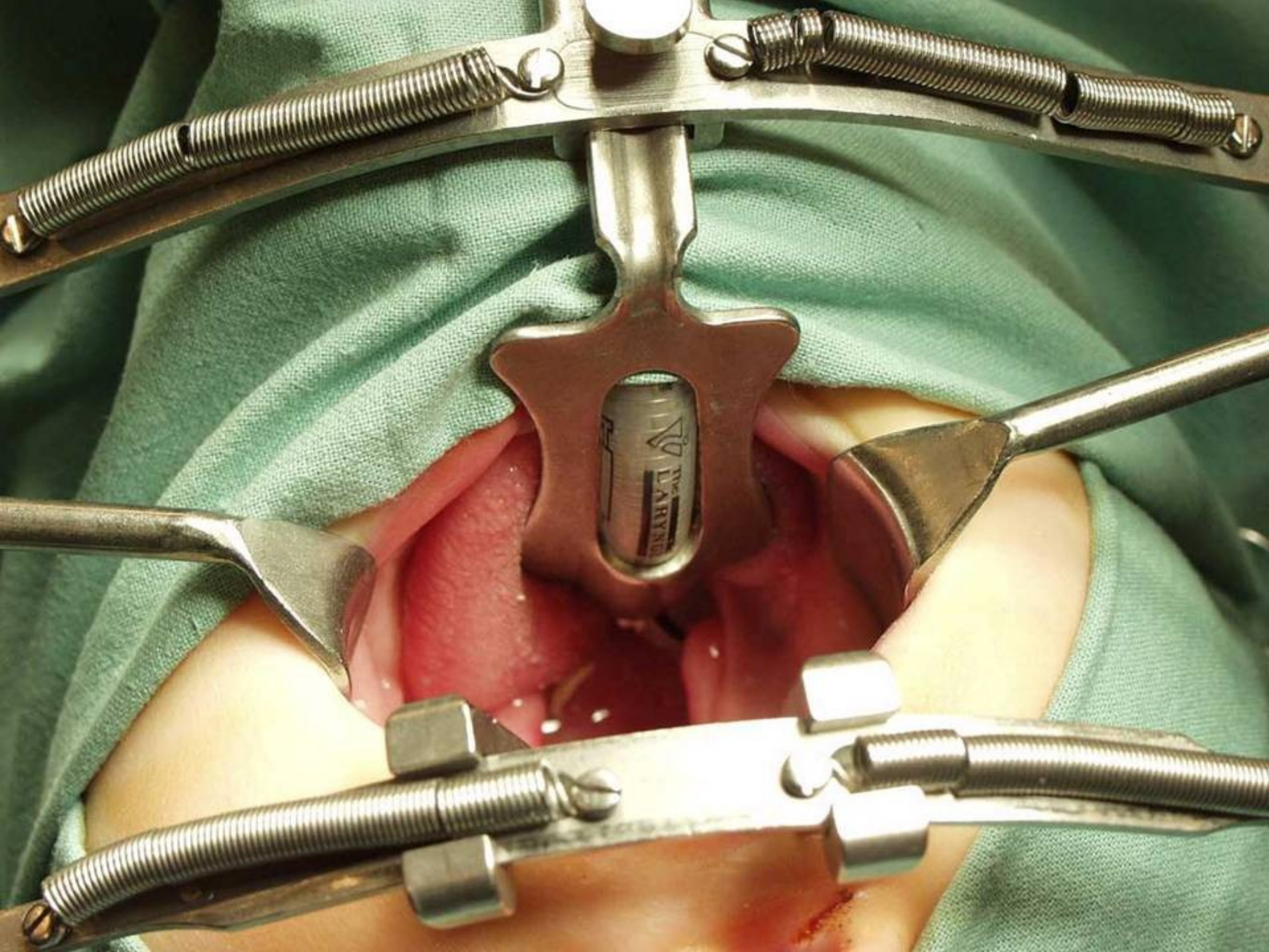
# LMA before insertion

- Visual control of integrity & pre use checks
- Preinflation (keep shape and pressure)
- Deflation
- Well lubricated – neutral gel



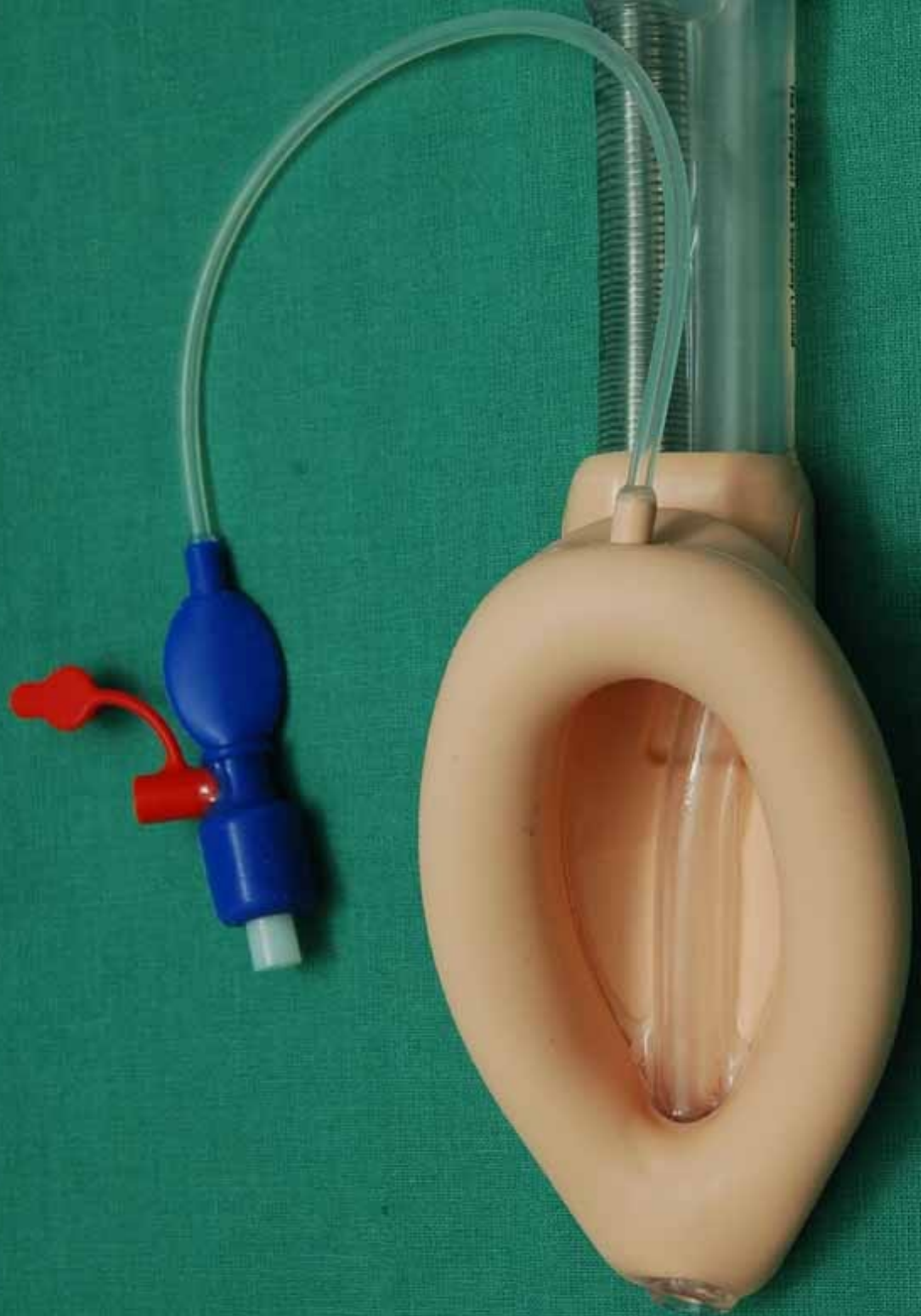
# Insertion of the LMA in Neutral Alignment

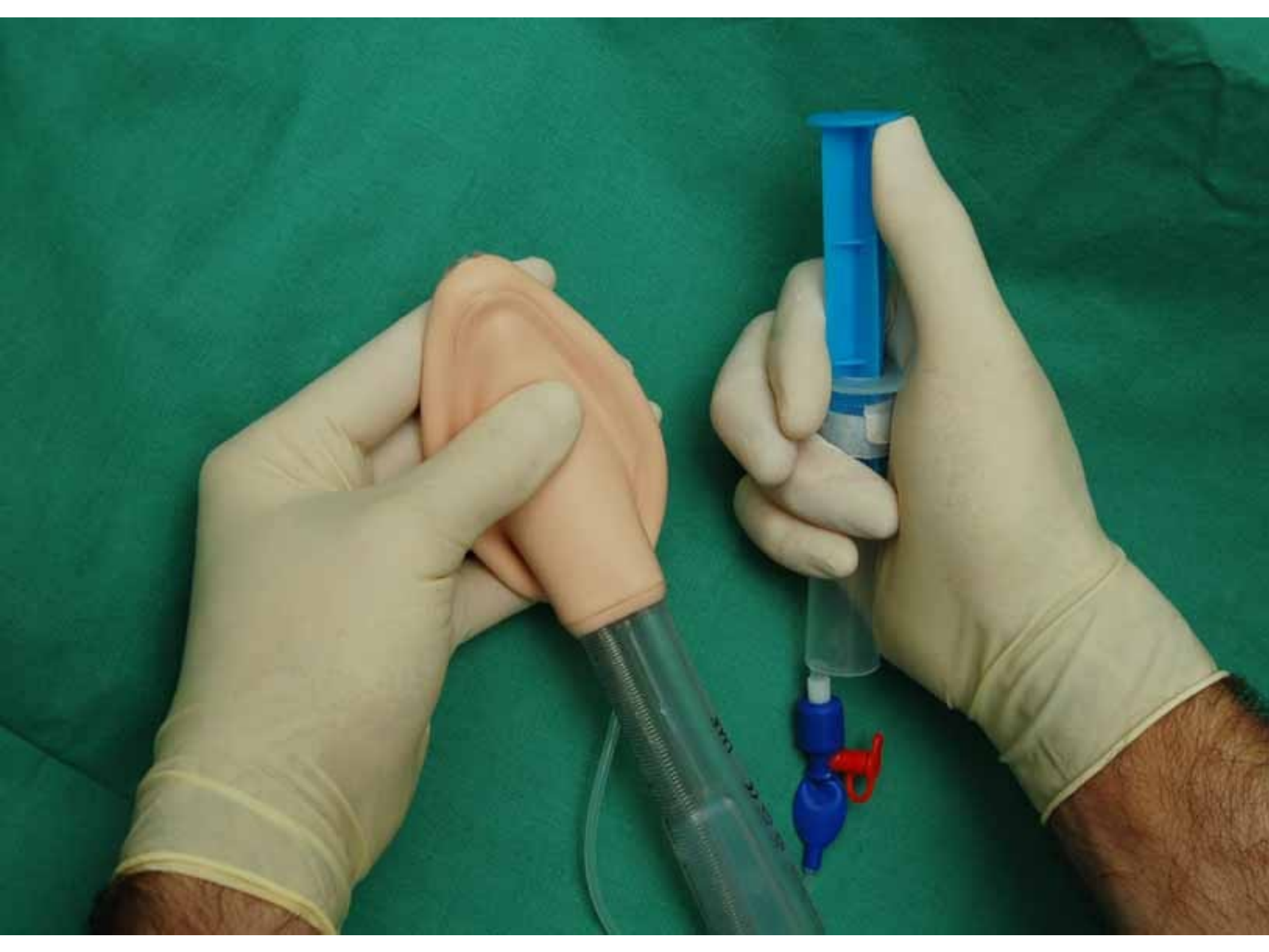


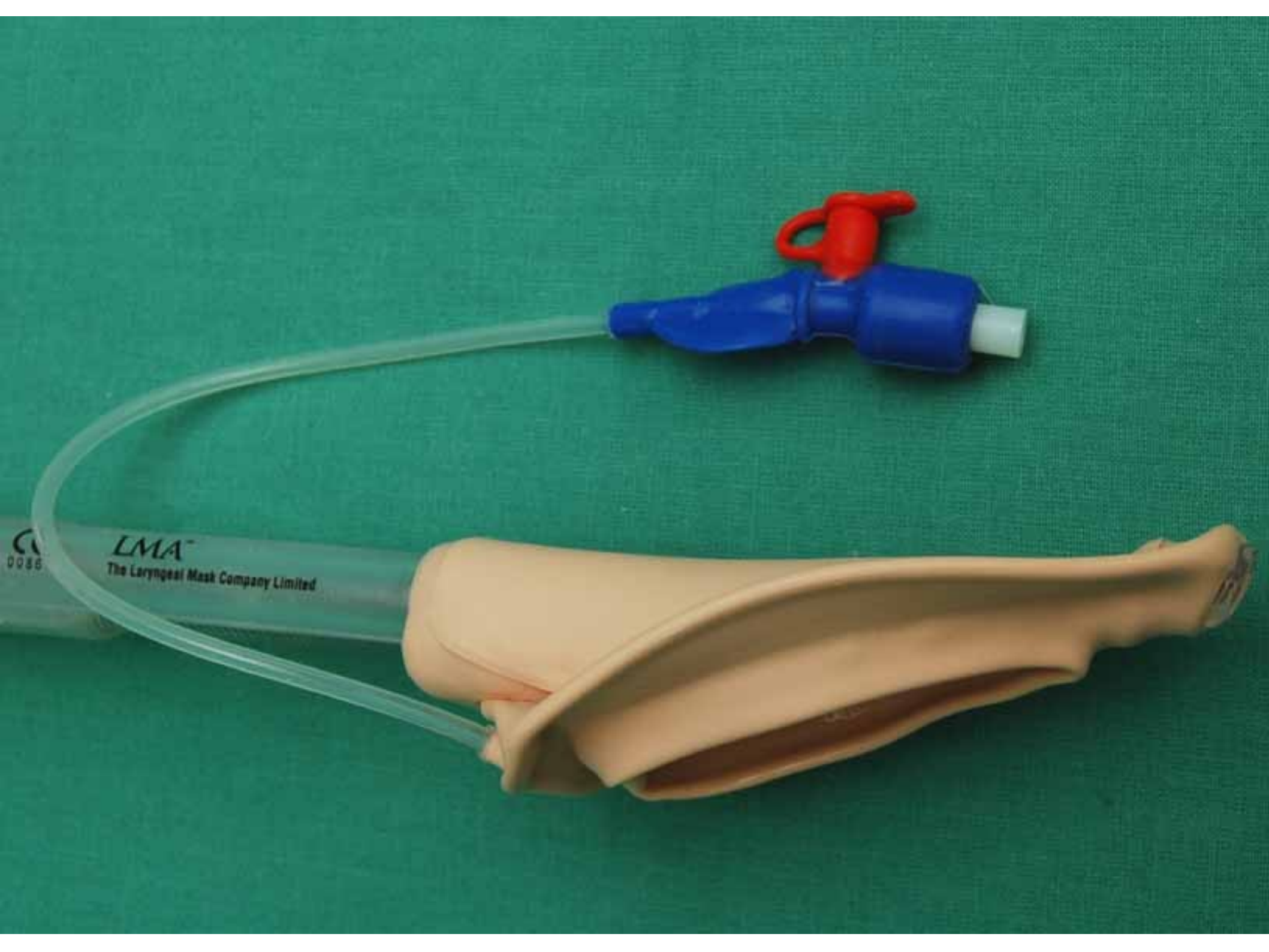


# LMA ProSeal

deflate = flat, thin







LMA  
The Laryngeal Mask Company Limited

0086

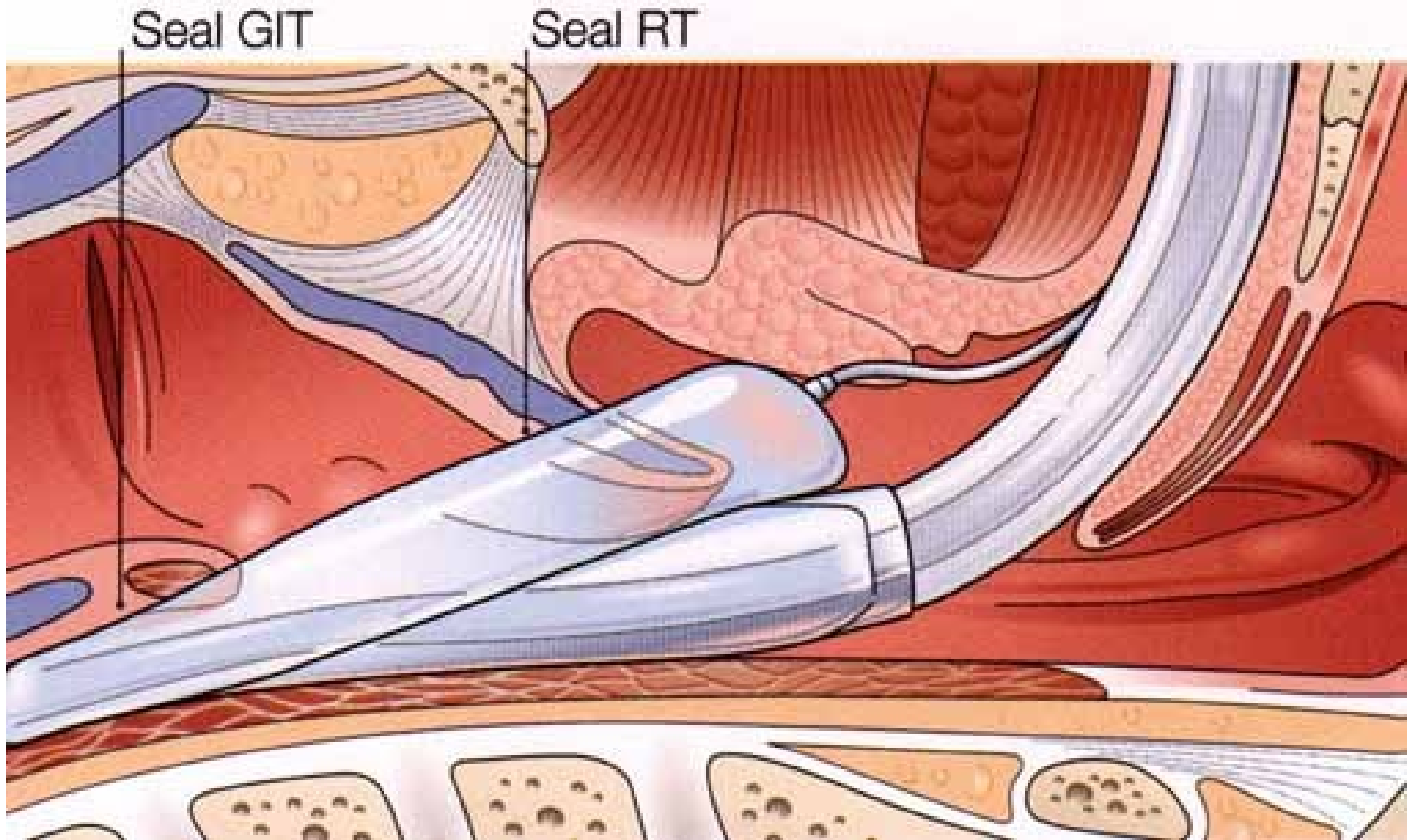




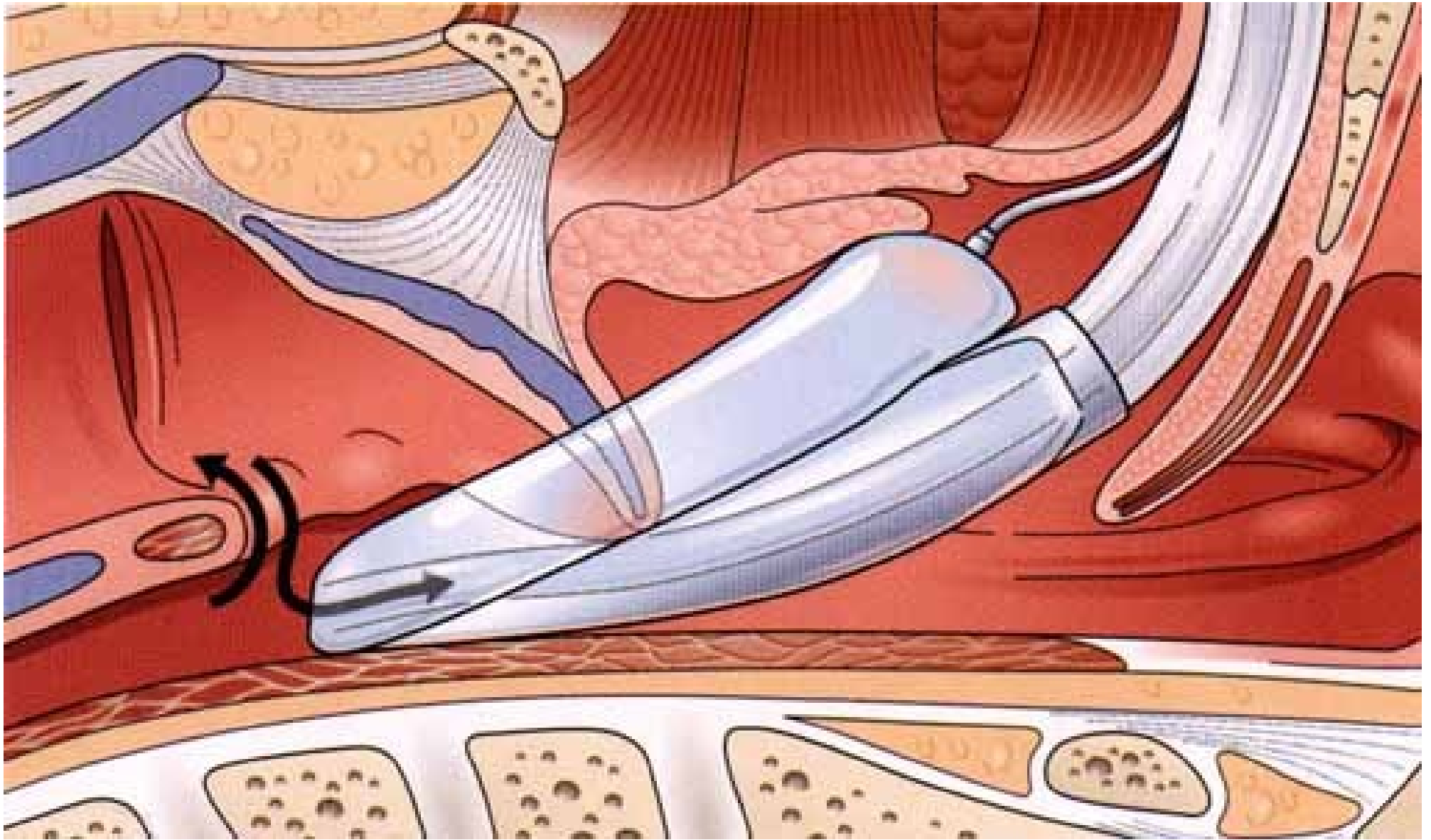
# Sizes of supraglottic devices LMA Supreme™

<b>Size of LMA Supreme</b>	<b>Ideal weight</b>	<b>Maximal Volume of Air</b>	<b>Max. size of G tube</b>
1	Newborn do 5kg	5 ml	6 Fr
1.5	Infant 5-10kg	8 ml	6 Fr
2	Infant 10-20kg	12 ml	10 Fr
2.5	Child 20-30kg	18 ml	10 Fr
3	Adult/child 30-50kg	30 ml	14 Fr
4	Adult 50-70kg	45 ml	14 Fr
5	Adult 70-100kg	45 ml	14 Fr

# Corect placement

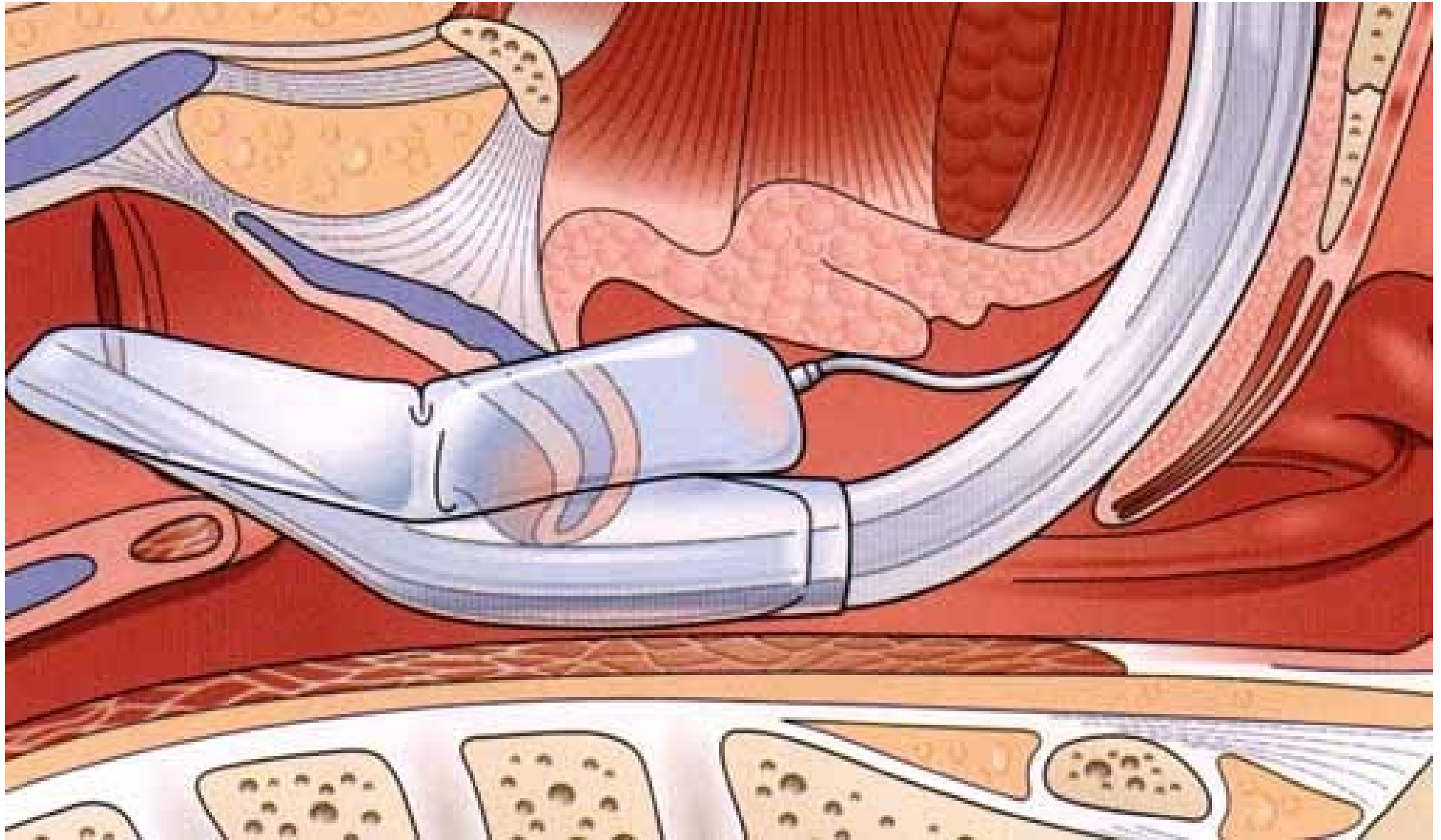


# Malposition I.



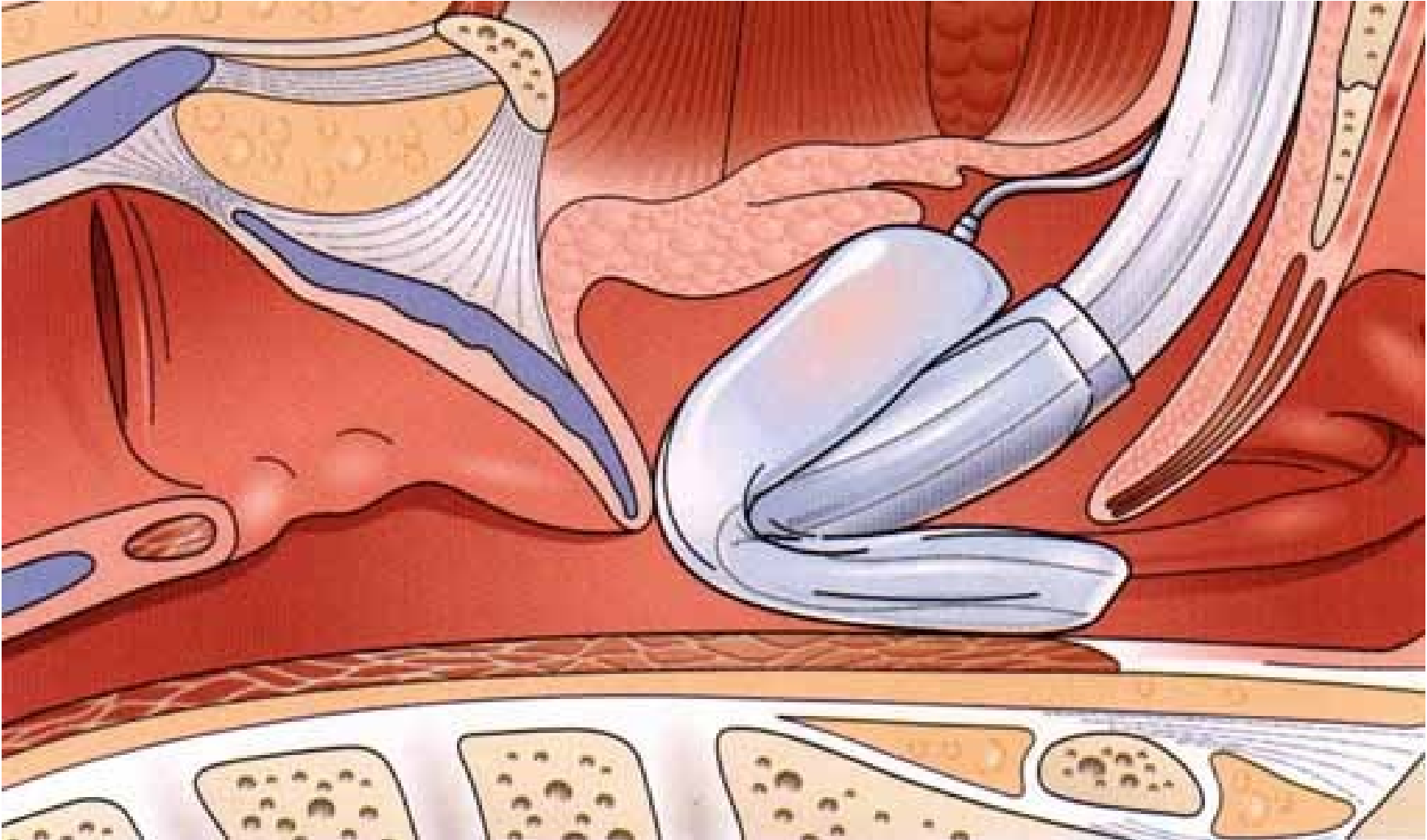
Distální manžeta v oropharyngu - není těsnost s respiračním a GIT.  
**Co hrozí: Aspirace, obstrukce - epiglottis v dutině LMA, inflace žaludku**

# Malposition II.



Distální část manžety v glottic inlet.  
**Totální obstrukce dýchacích cest**

# Malposition III.



**Distální část manžety v nasopharyngu:**

**Zavádění reversní Guedelovou technikou nebo v poloze chin to chest (ignore sniffing position).  
Může být slučitelná se zachováním průchodnosti dýchacích cest, **extremní riziko aspirace** - není ochrana před regurgitací distálním koncem manžety.**

# Intubating laryngeal mask airway (ILMA)

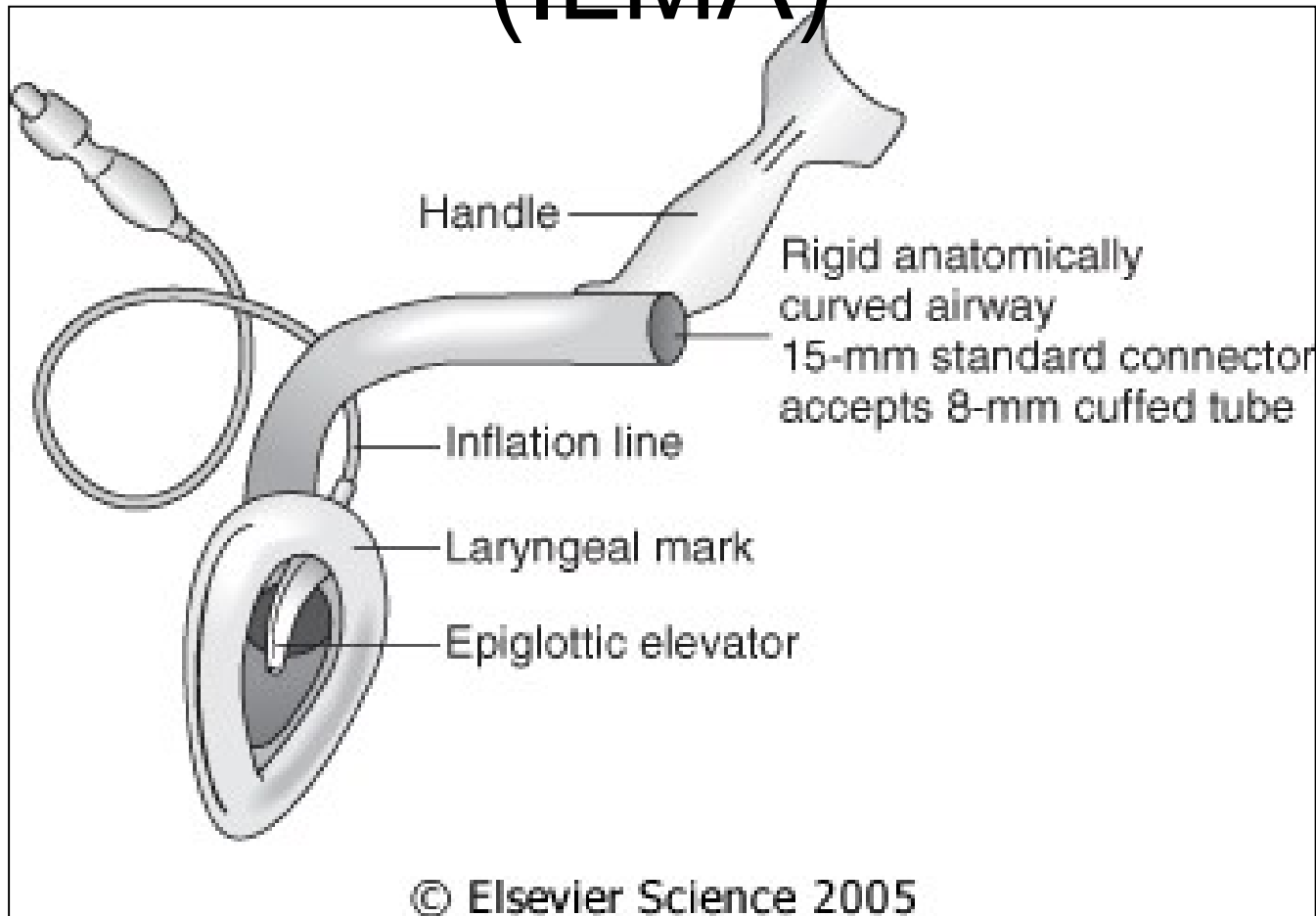


Figure 42-11 Intubating laryngeal mask airway (ILMA), illustrating the rigid curve and handle. Notice the different window compared with a standard LMA. (Courtesy of LMA North America, Inc., San Diego, CA.)

# *Supraglottic devices:*

- LM
- Combitube
- Laryngeal tubus
- I-gel



## **Combitube**

- emergency situations instead OTI
- I: difficult airway
- CI: stenosing process in pharynx / trachea







Figure 42-13 Insertion of the Combitube. A, The tongue and mandible are lifted with one hand, and the Combitube is inserted in the direction of the natural curvature of the pharynx with the other hand. The printed ring is aligned with the teeth. B, The pharyngeal cuff is inflated with 100 mL of air, and the distal cuff is inflated with 15 mL. C, Ventilation is begun through the longer no. 1 tube because placement is usually in the esophagus. D, If ventilation is absent and the stomach is being insufflated, begin ventilation through the no. 2 connecting tube. (Courtesy of Sheridan Catheter Corp., Argyle, NY.)

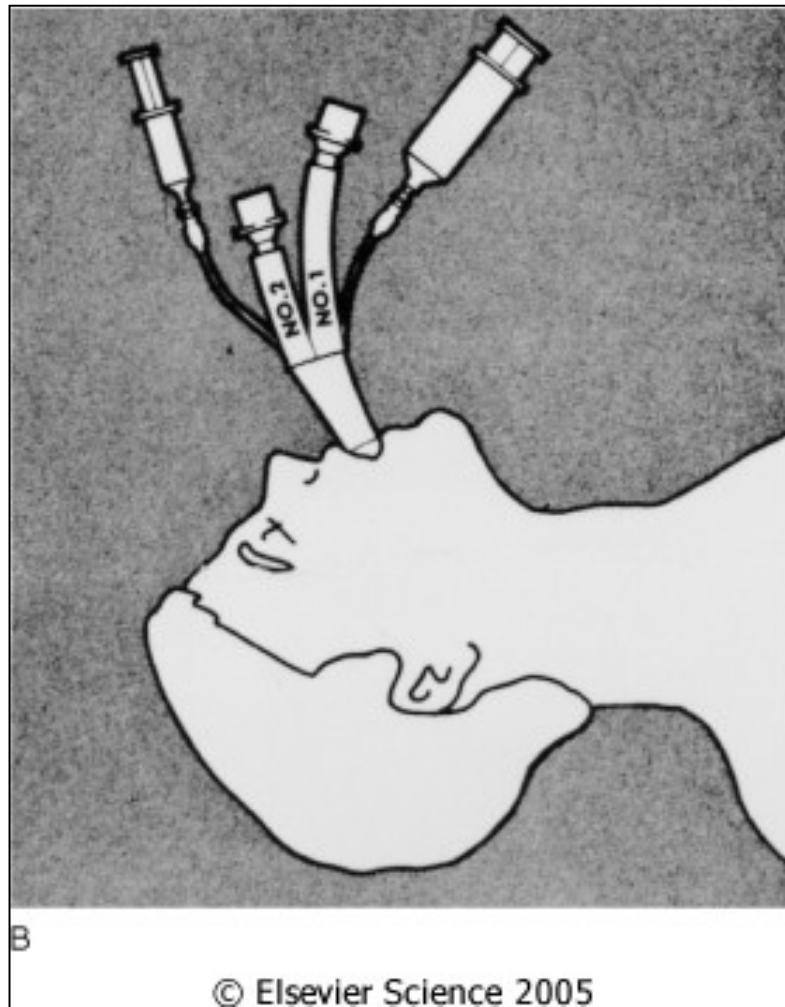


Figure 42-13 Insertion of the Combitube. A, The tongue and mandible are lifted with one hand, and the Combitube is inserted in the direction of the natural curvature of the pharynx with the other hand. The printed ring is aligned with the teeth. B, The pharyngeal cuff is inflated with 100 mL of air, and the distal cuff is inflated with 15 mL. C, Ventilation is begun through the longer no. 1 tube because placement is usually in the esophagus. D, If ventilation is absent and the stomach is being insufflated, begin ventilation through the no. 2 connecting tube. (Courtesy of Sheridan Catheter Corp., Argyle, NY.)

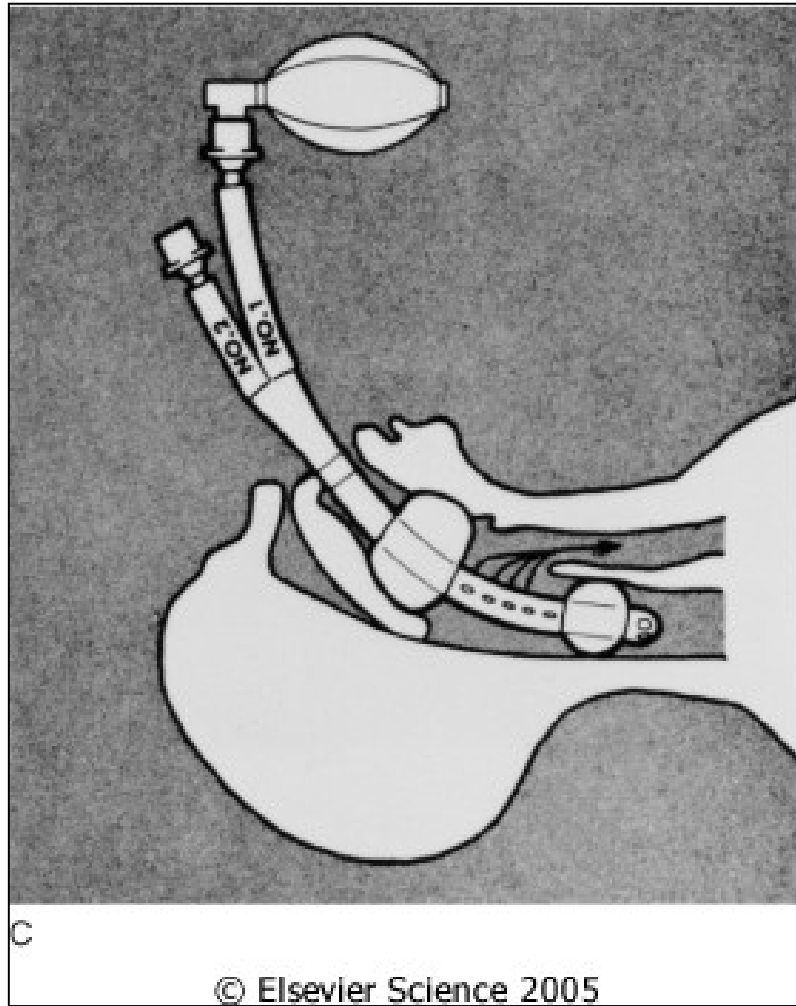


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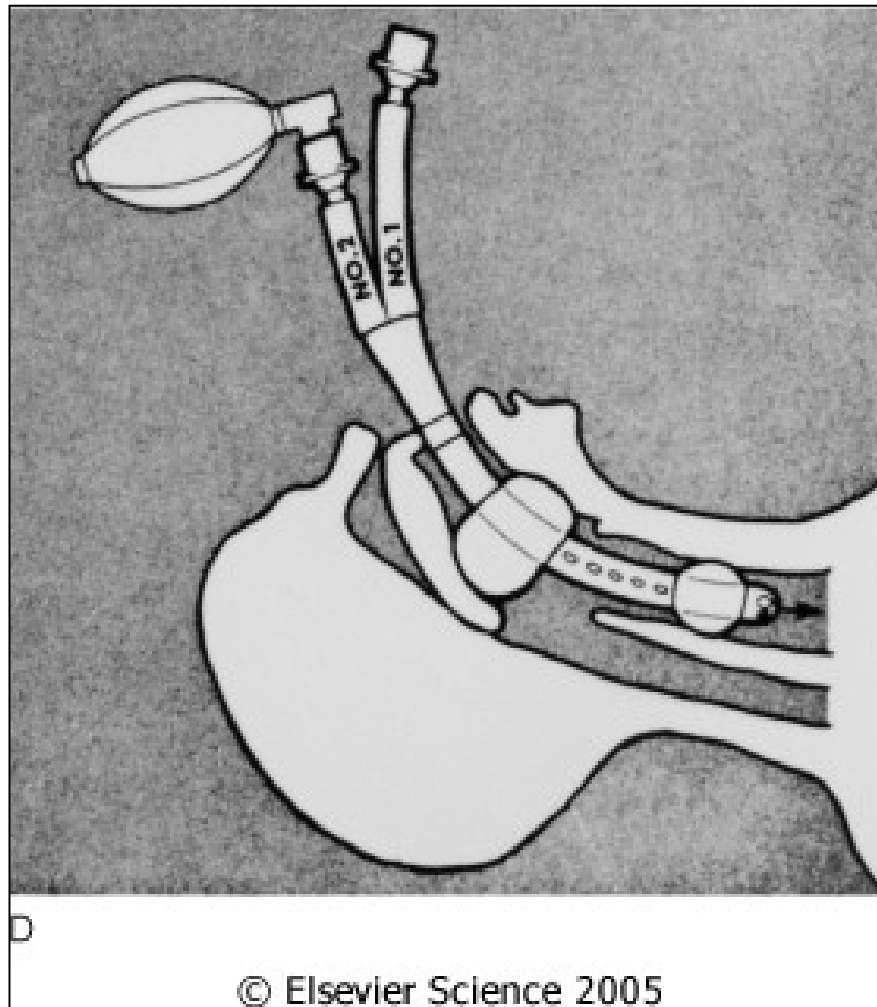


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# Video Laryngoscopy

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## *Tracheal intubation*

Def: Placing tube to trachea through mouth/nose and larynx.

I:

- maintain open airway (GCS < 8)
- toilet (no cough)
- maintain ventilation (shock, hypoventilation)

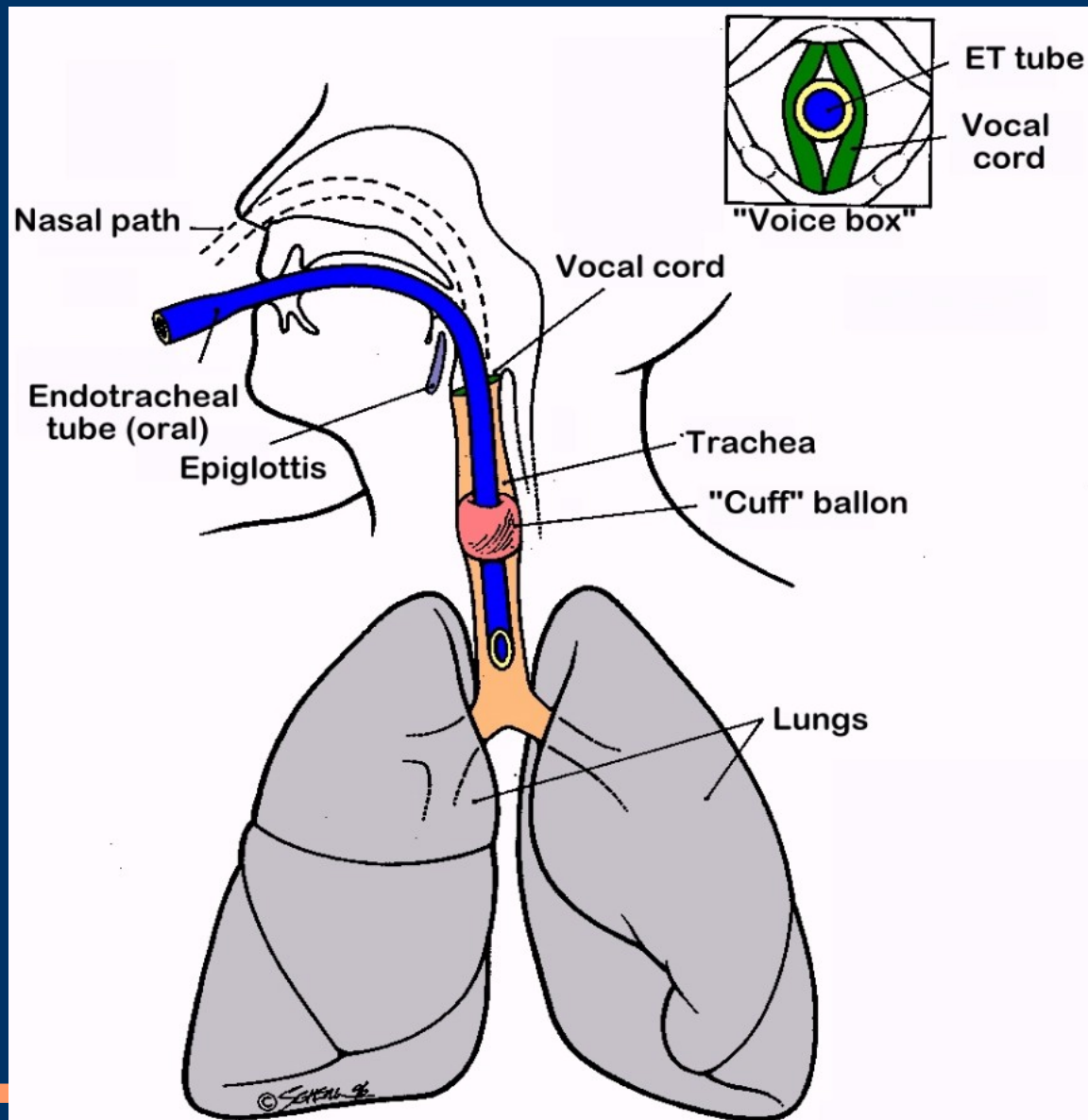
narrowest place in airway – vocal cords  
– subglottic space (<8years)

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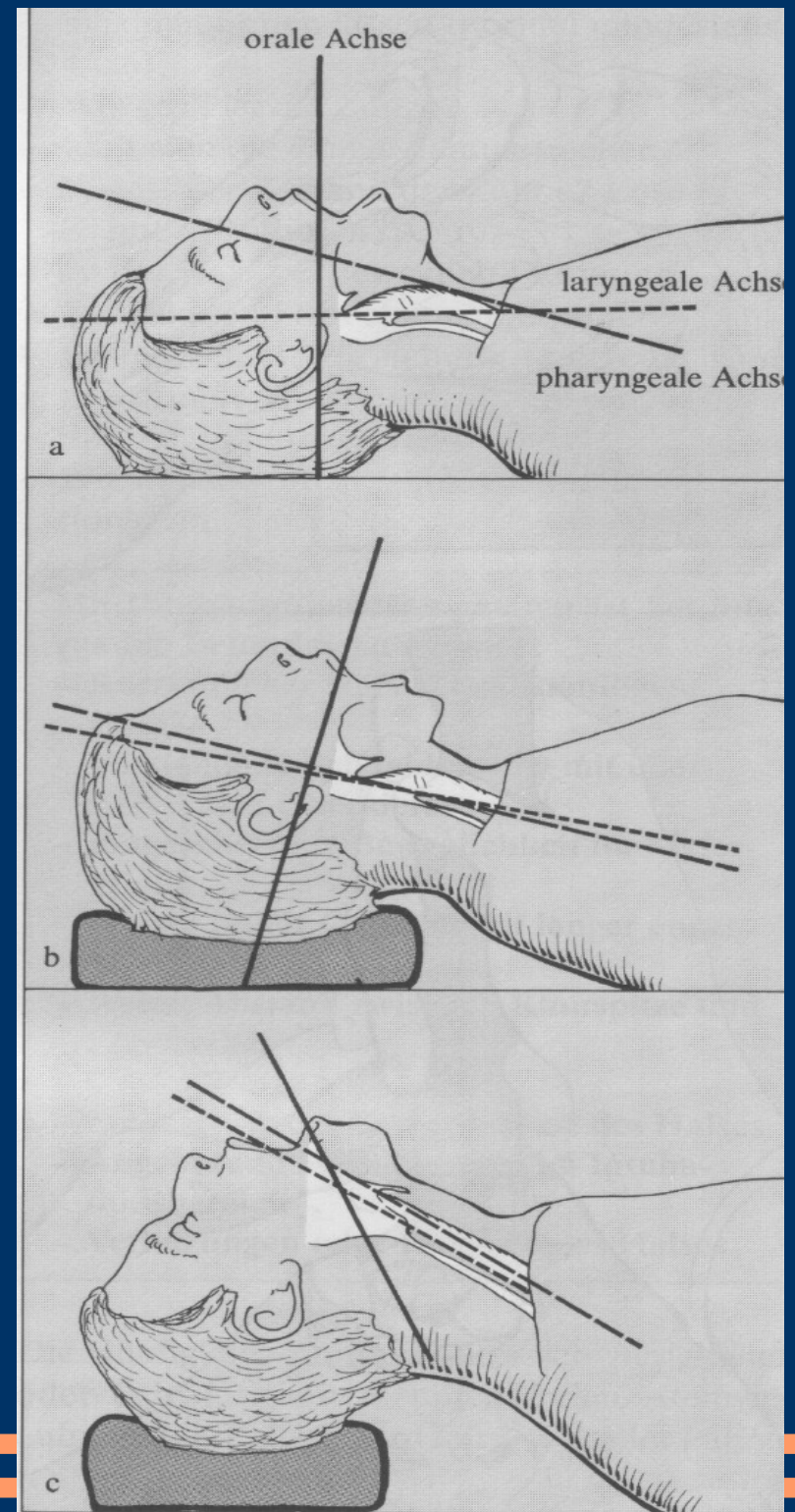
## OTI, NTI - aids:

- laryngoscope
- Magill tongs
- tracheal tubes
- syringe
- lead, bougie
  
- bronchoscope



## How to:

- prepare all aids, (ventilate)
- position of p.
- LA, GA, coma
- direct laryngoscopy
- placing tube
- inflate cuff
- ensure position





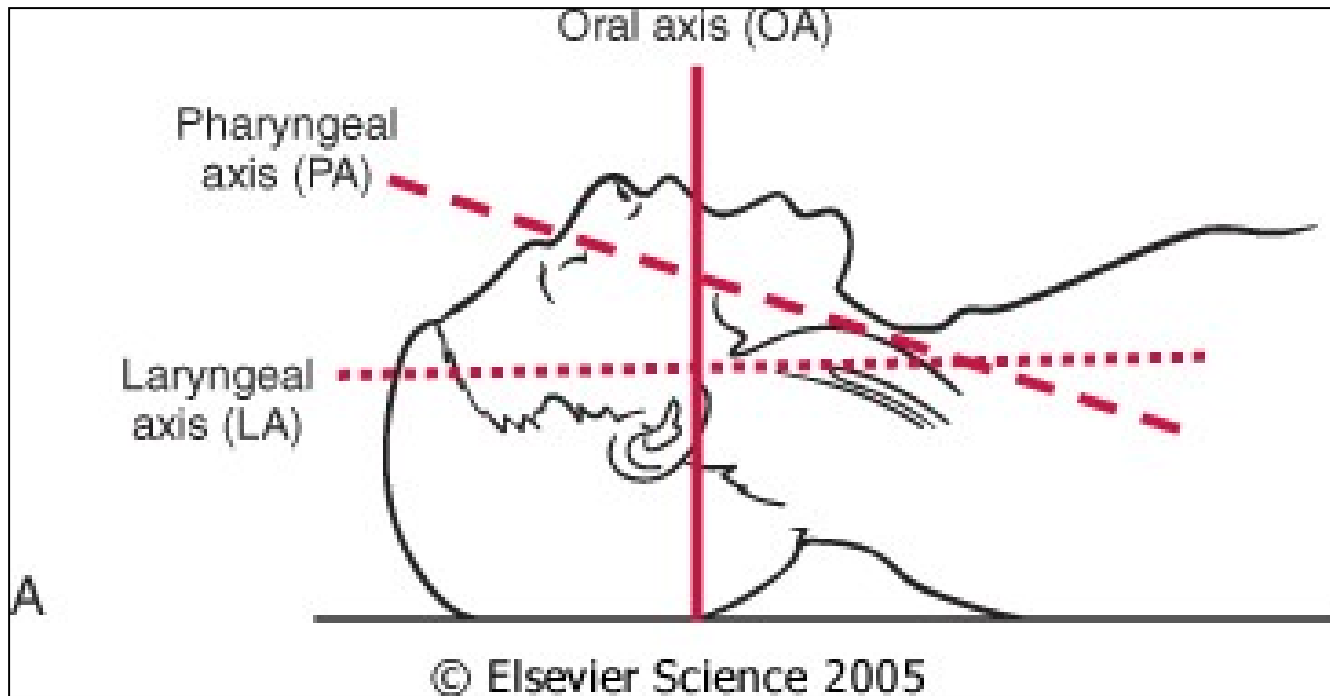


Figure 42-3 Schematic diagram demonstrating the head position for endotracheal intubation. A, Successful direct laryngoscopy for exposure of the glottic opening requires alignment of the oral, pharyngeal, and laryngeal axes. B, Elevation of the head about 10 cm with pads below the occiput and with the shoulders remaining on the table aligns the laryngeal and pharyngeal axes. C, Subsequent head extension at the atlanto-occipital joint creates the shortest distance and most nearly straight line from the incisor teeth to glottic opening.

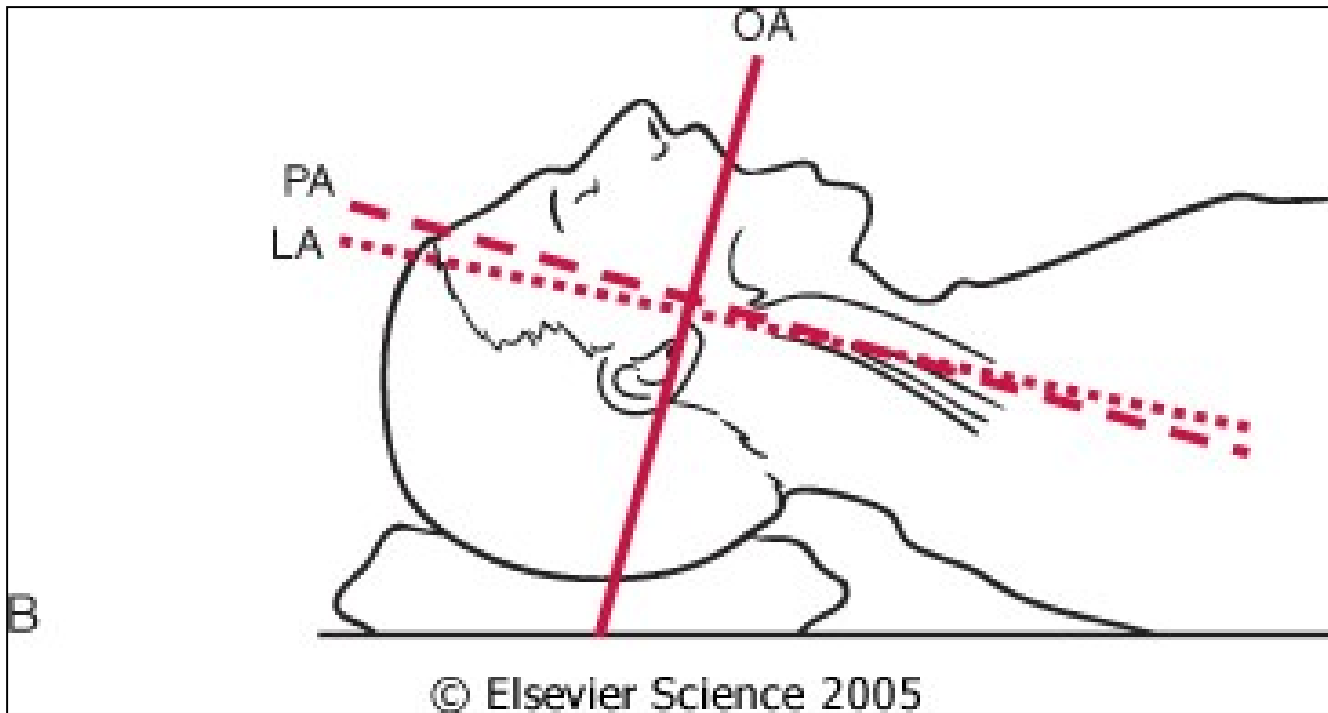


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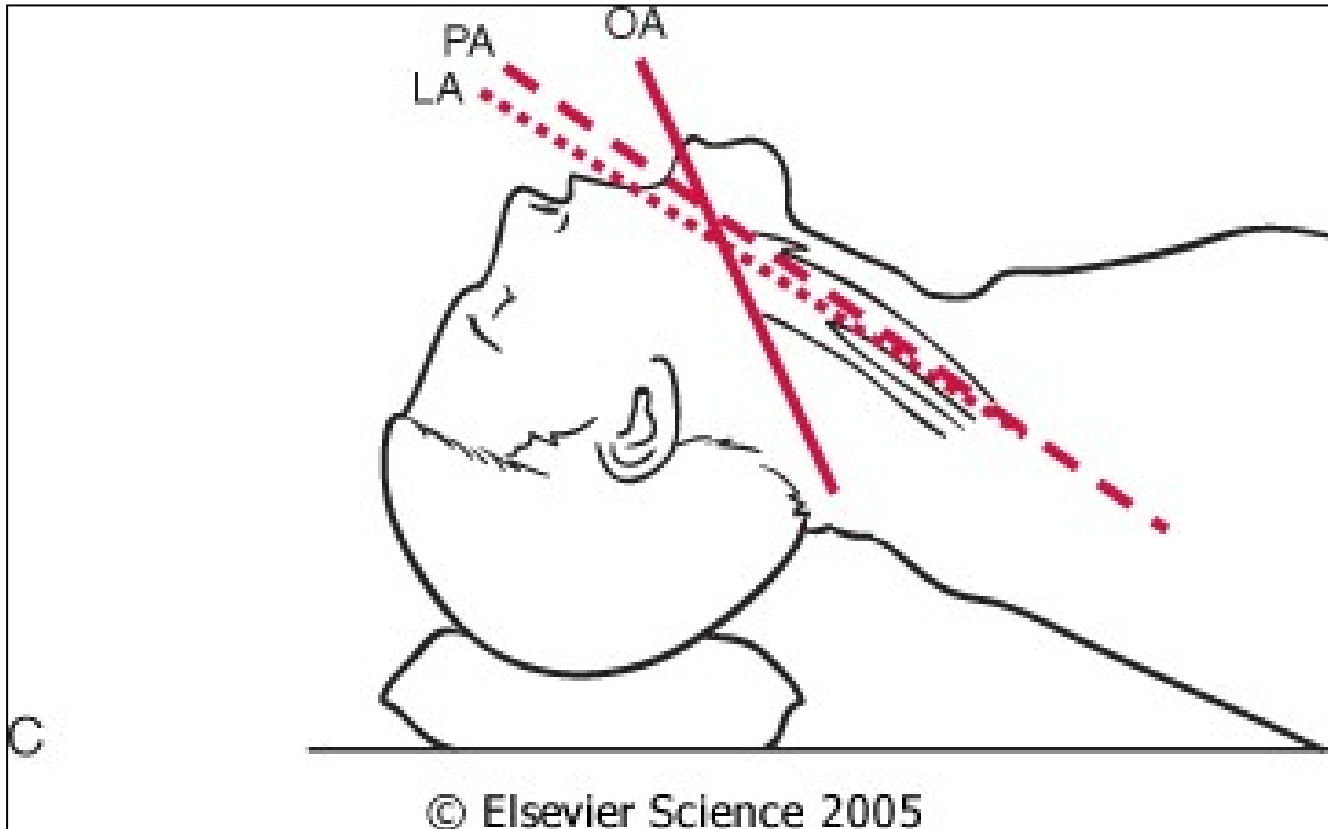
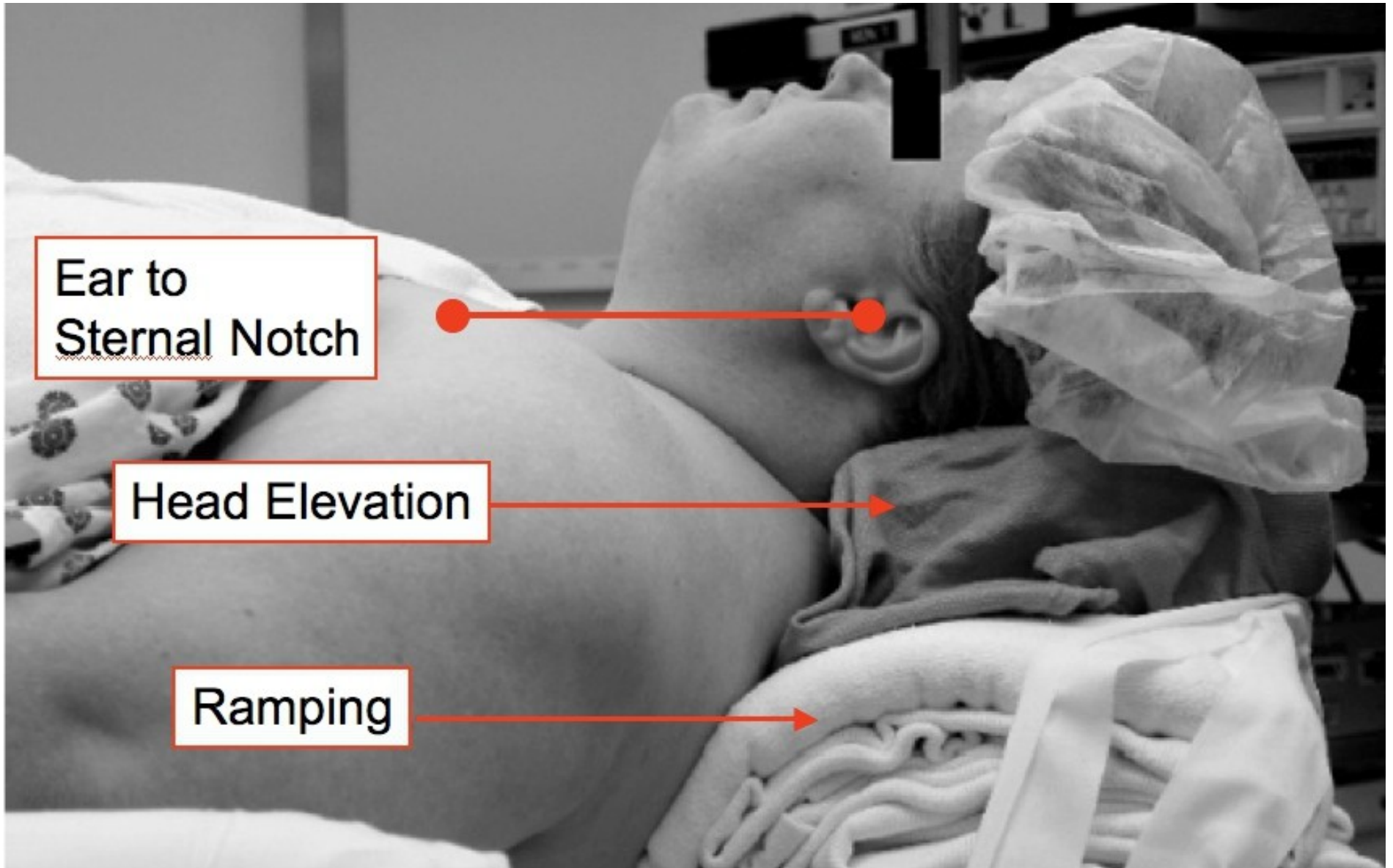


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# Positioning of ob. Patient.

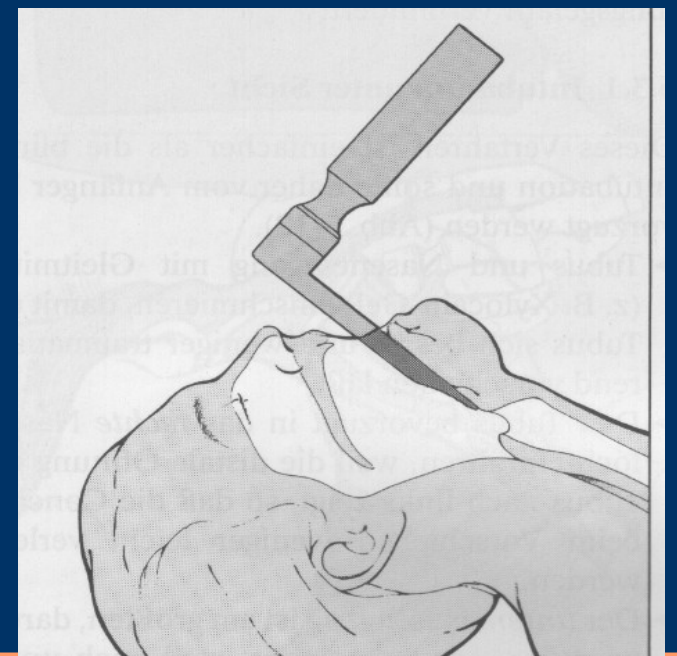
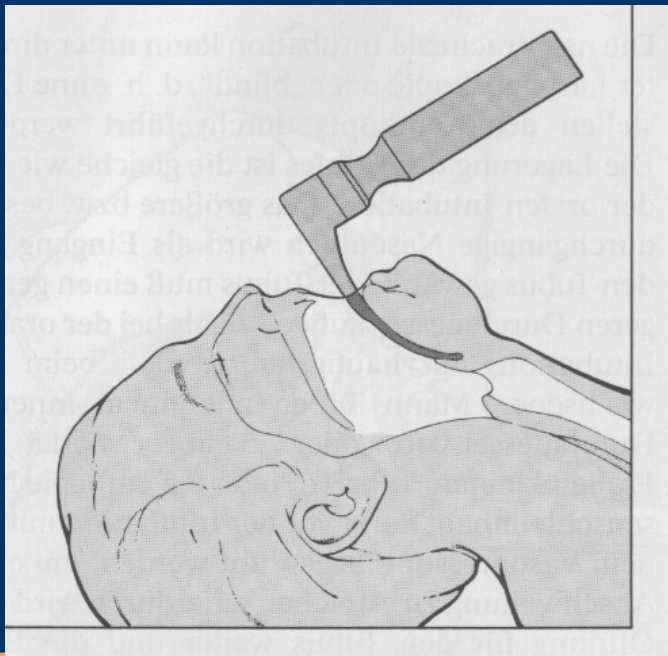
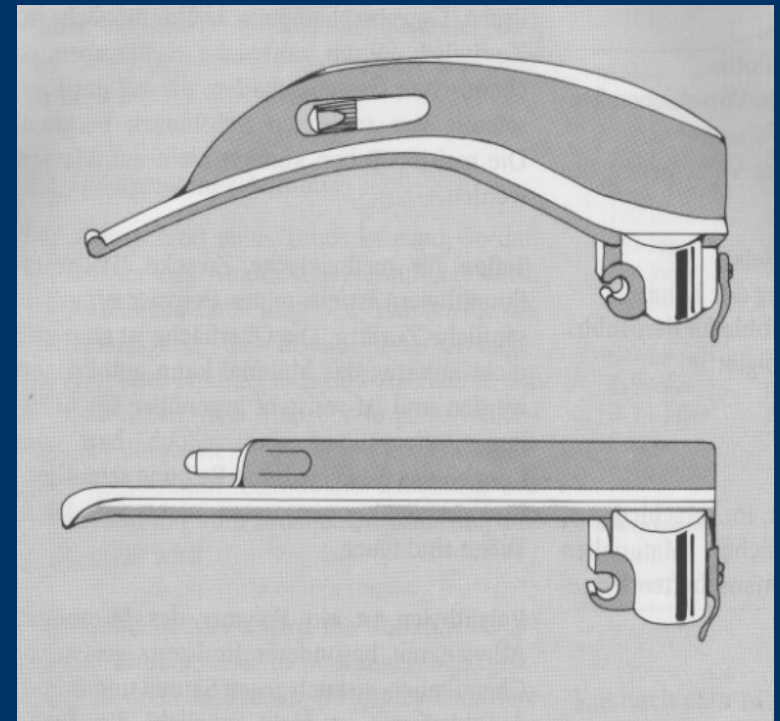


# Size of TT

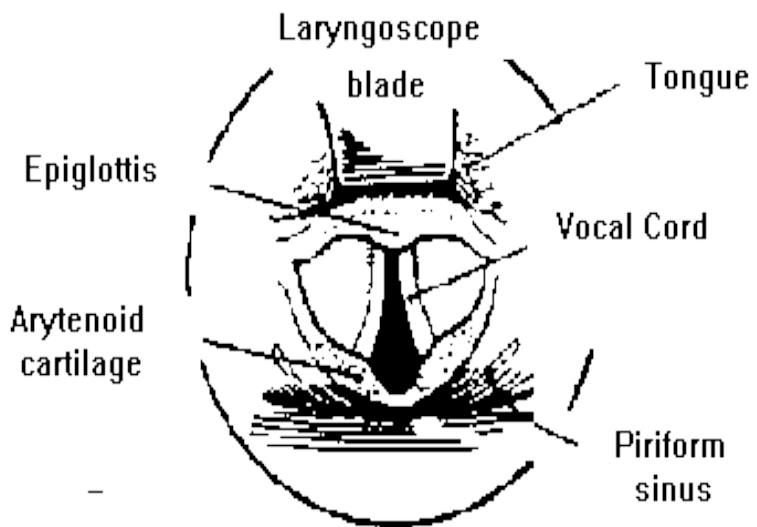
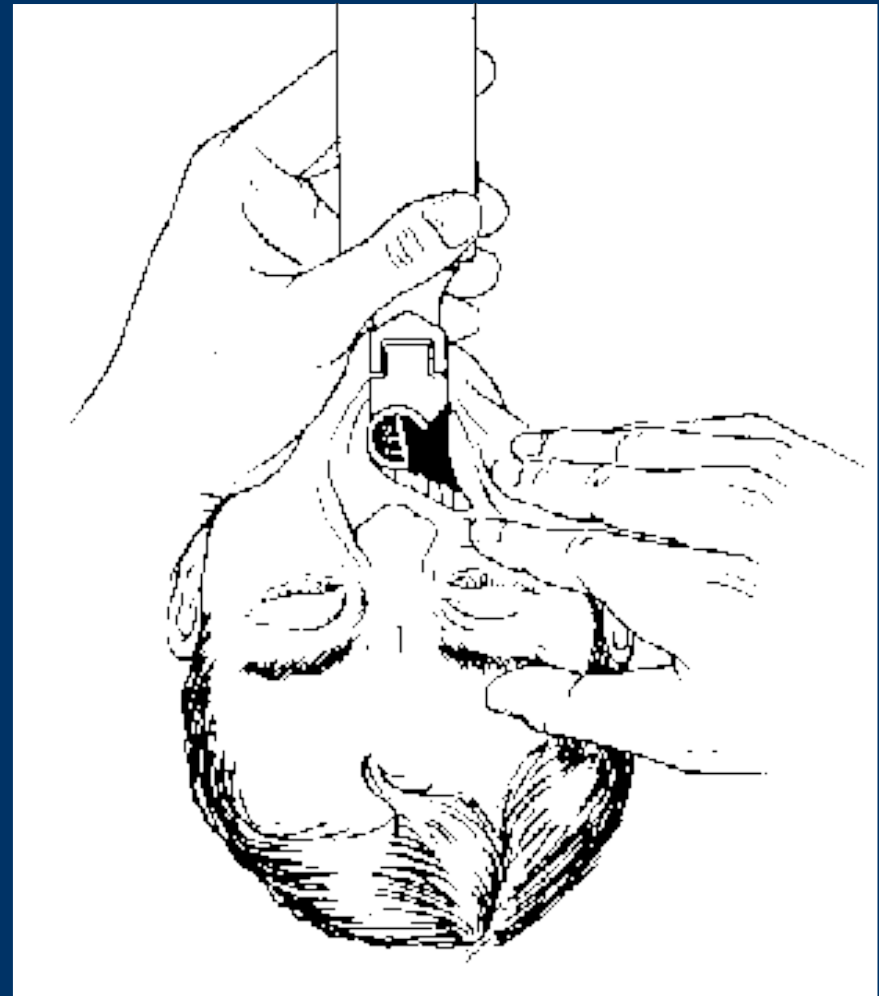
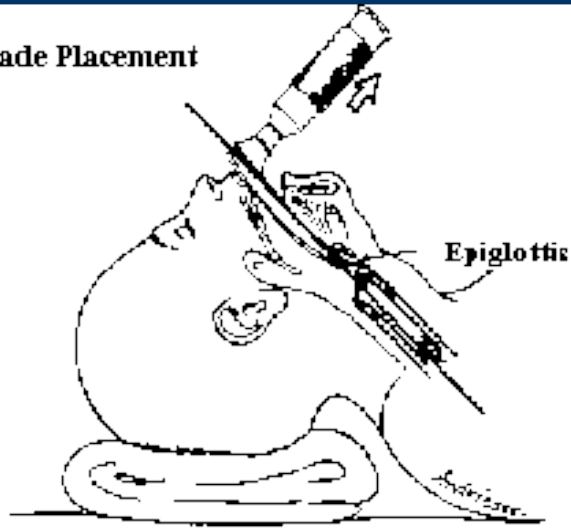
<b>Age</b>	<b>Internal Diameter (mm)</b>	<b>External Diameter (mm)*</b>	<b>French Unit</b>	<b>Distance Inserted from Lips for Tip Placement in the Midtrachea (cm)†</b>
Premature	2,5	3,3	10	10
Term newborn	3	4.0-4.2	12	11
1-6 mo	3,5	4.7-4.8	14	11
6-12 mo	4	5.3-5.6	16	12
2 yr	4,5	6.0-6.3	18	13
4 yr	5	6.7-7.0	20	14
6 yr	5,5	7.3-7.6	22	15-16
8 yr	6	8.0-8.2	24	16-17
10 yr	6,5	8.7-9.3	26	17-18
12 yr	7,0	9.3-10.0	28-30	18-22
≥14 yr	7.0 (females)	9.3-10.0	28-30	20-24
	8.0 (males)	10.7-11.3	32-34	

## Laryngoscope:

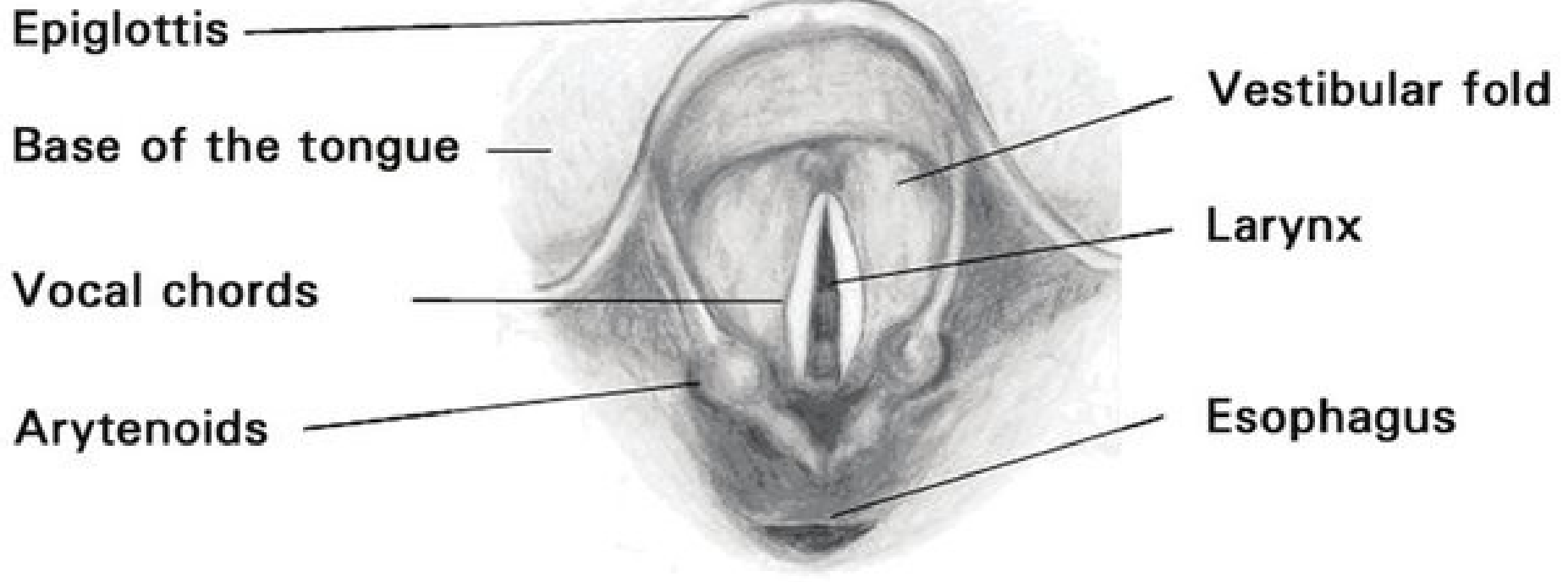
- crooked spoon - Macintosh
- straight spoon - Miller



**Straight Blade Placement**



# *Laryngoscopic view*





## *Laryngoscopic view:*



radix of tongue

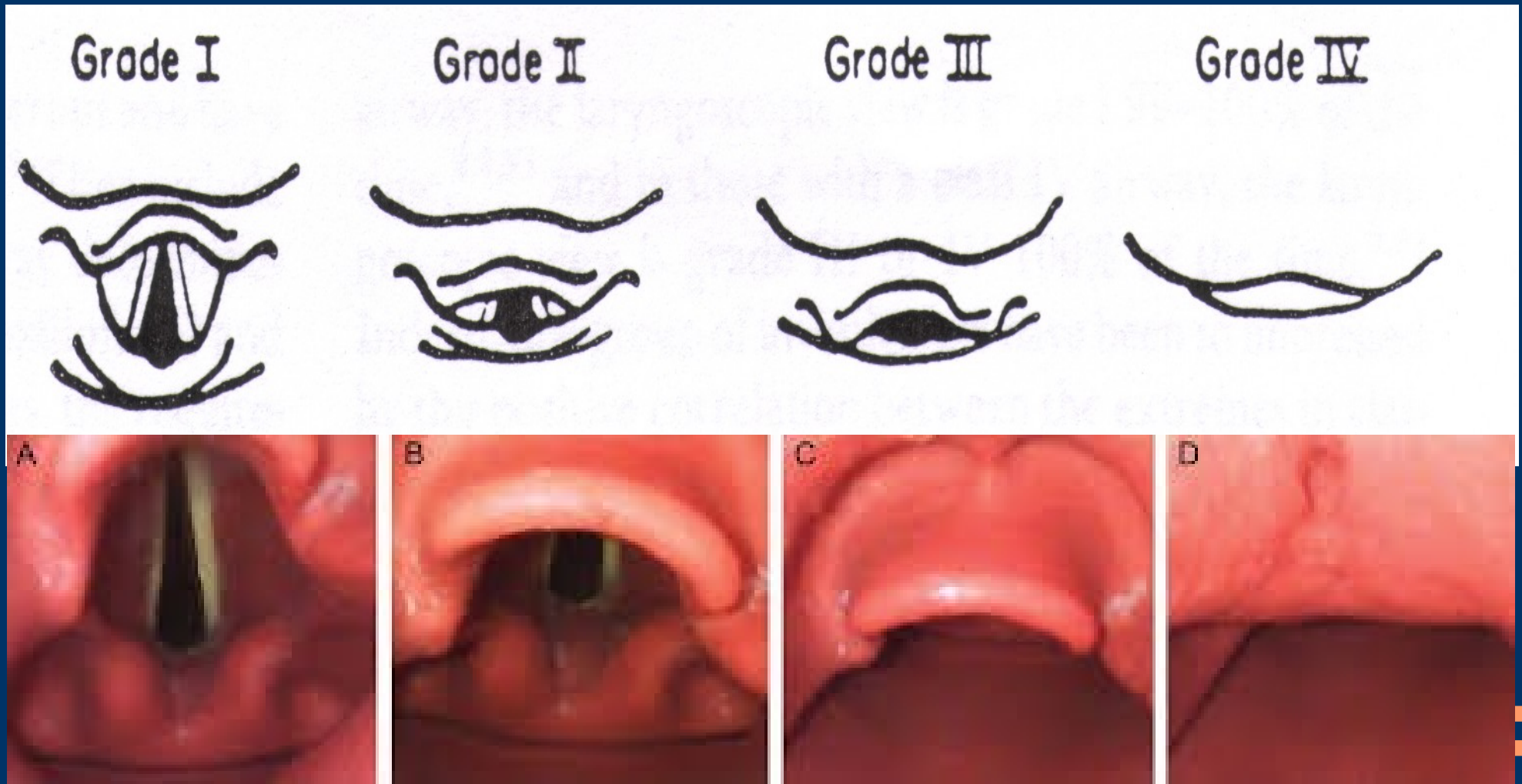
epiglottis

vocal cords

trachea

interarytenoid notch

# Always easy? (Cormac & Lehane)



# *Improvement of View*

- pressure over larynx
- BURP
  - backward, upward, and rightward pressure on the larynx



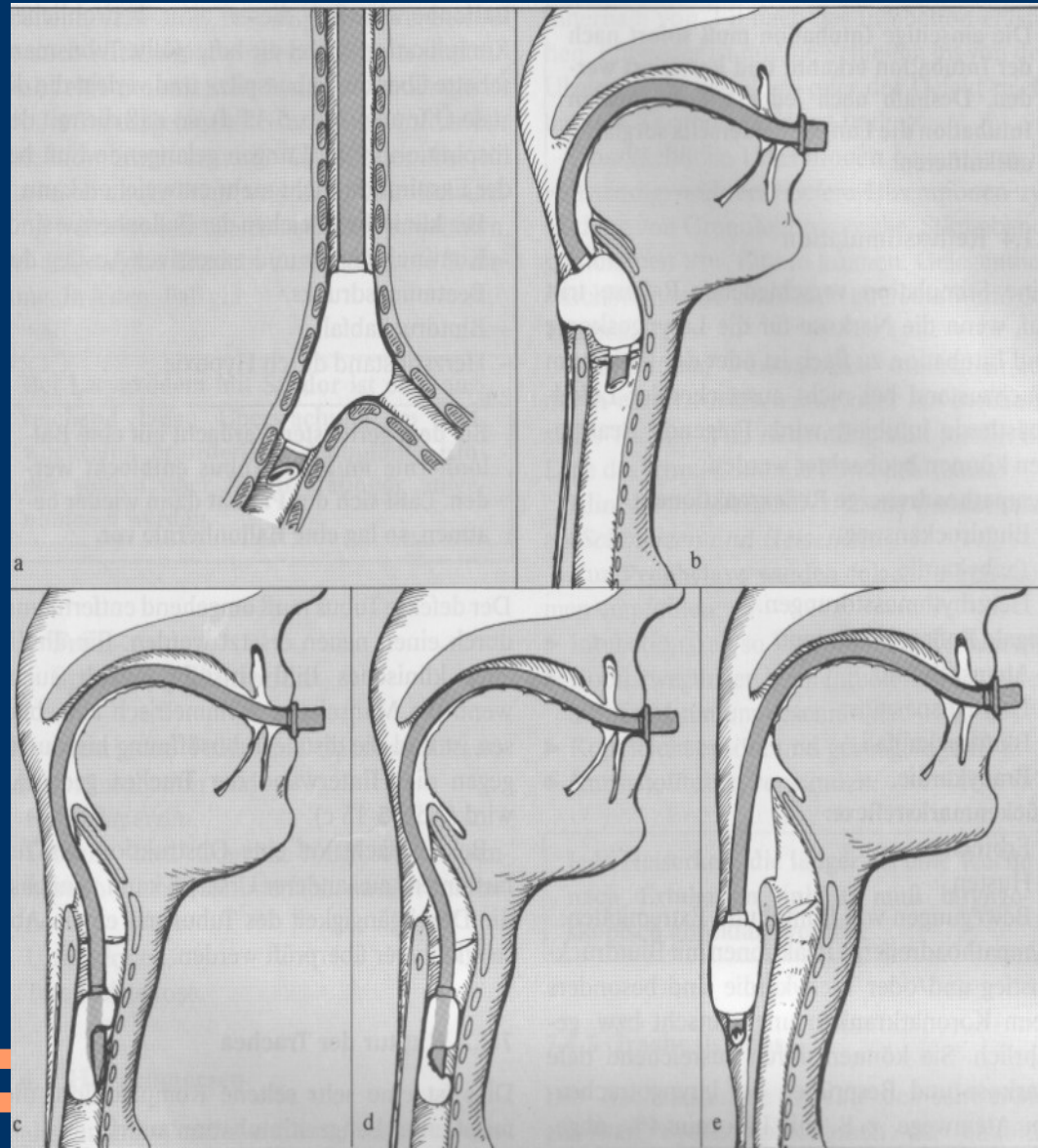
## *Verify placing of the tube*

- auscultation
- End tidal CO<sub>2</sub>
- fibroskopik view



## *Complications of TI - early:*

- trauma of teeth, soft tissue
- placed to esophagus / endobronchialy
- aspiration
- cardiovascular -  
↑BP, ↑f, arrhythmia
- ↑ ICP
- laryngospasmus, bronchospasmus



## *Complication of TI - later:*

- damage of vocal cords, trachea
- sinusitis, otitis,
- decubitus – lip, nose
- obturation of tracheal tube by secret, blood

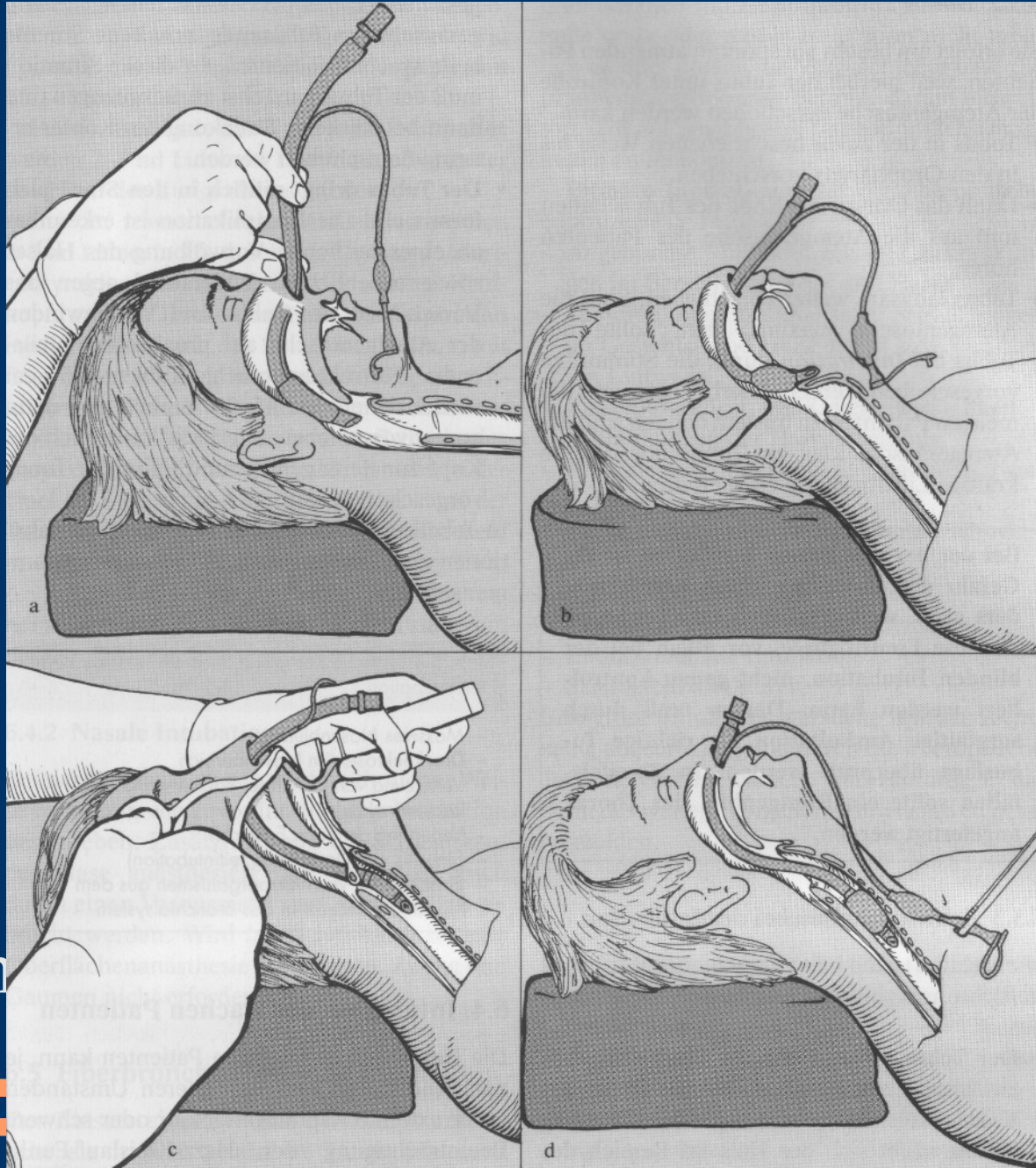
## How to do NTI:

- LA
- anemisation of nose
- tube through nose
- placing tube under visual control

CAVE:  
deviation of septum  
nasi

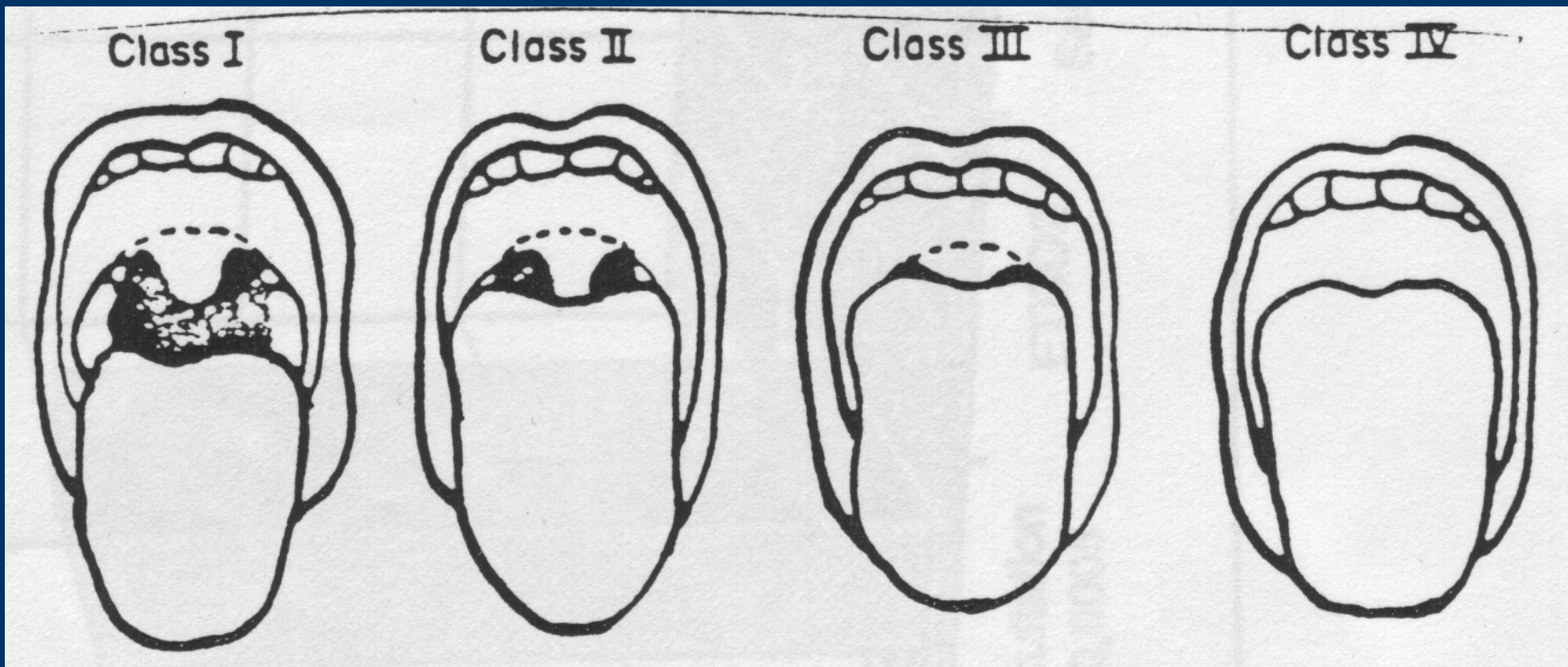
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## *Check your neck*

- Mallanpati

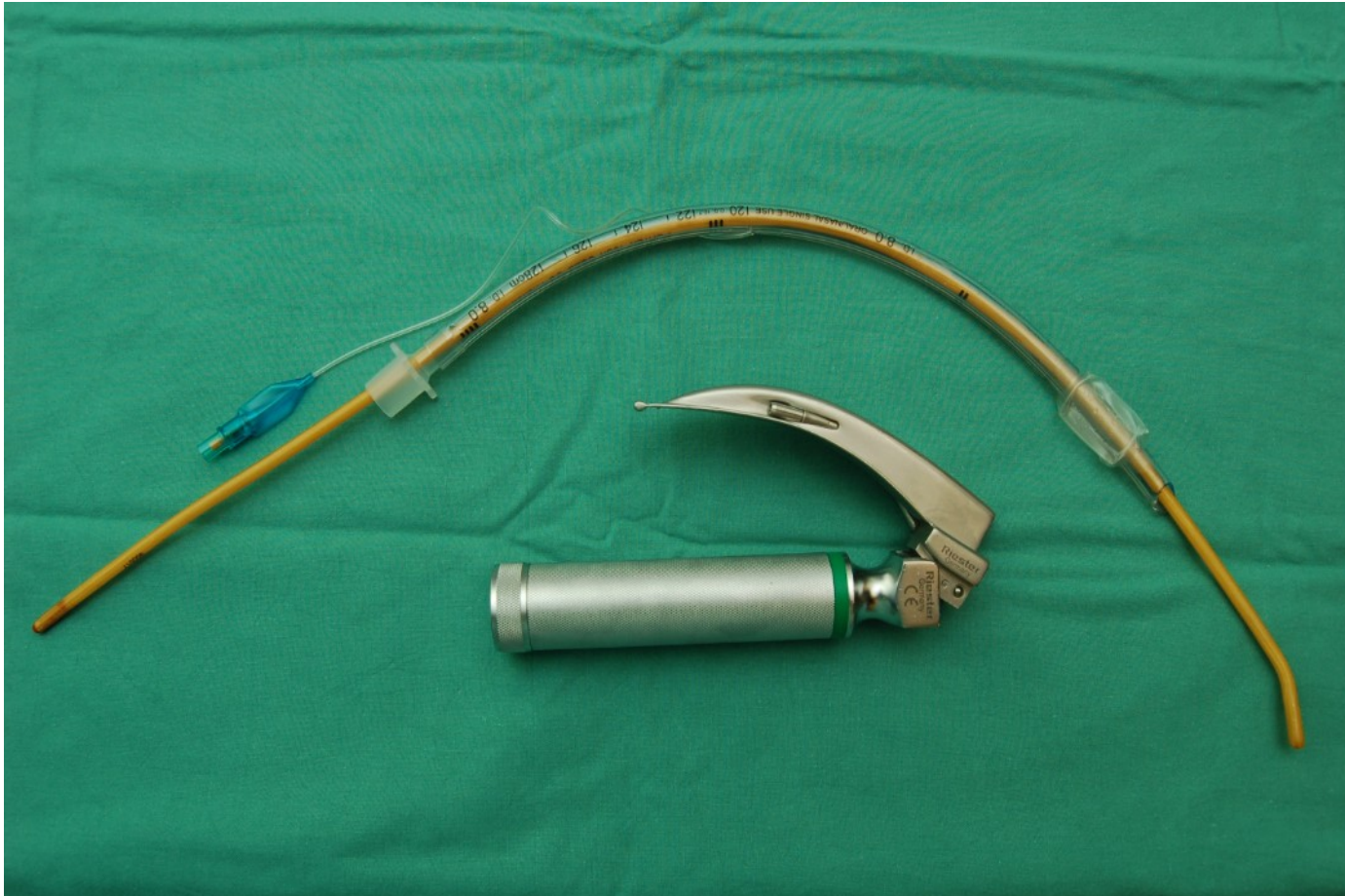


- 3-3-2



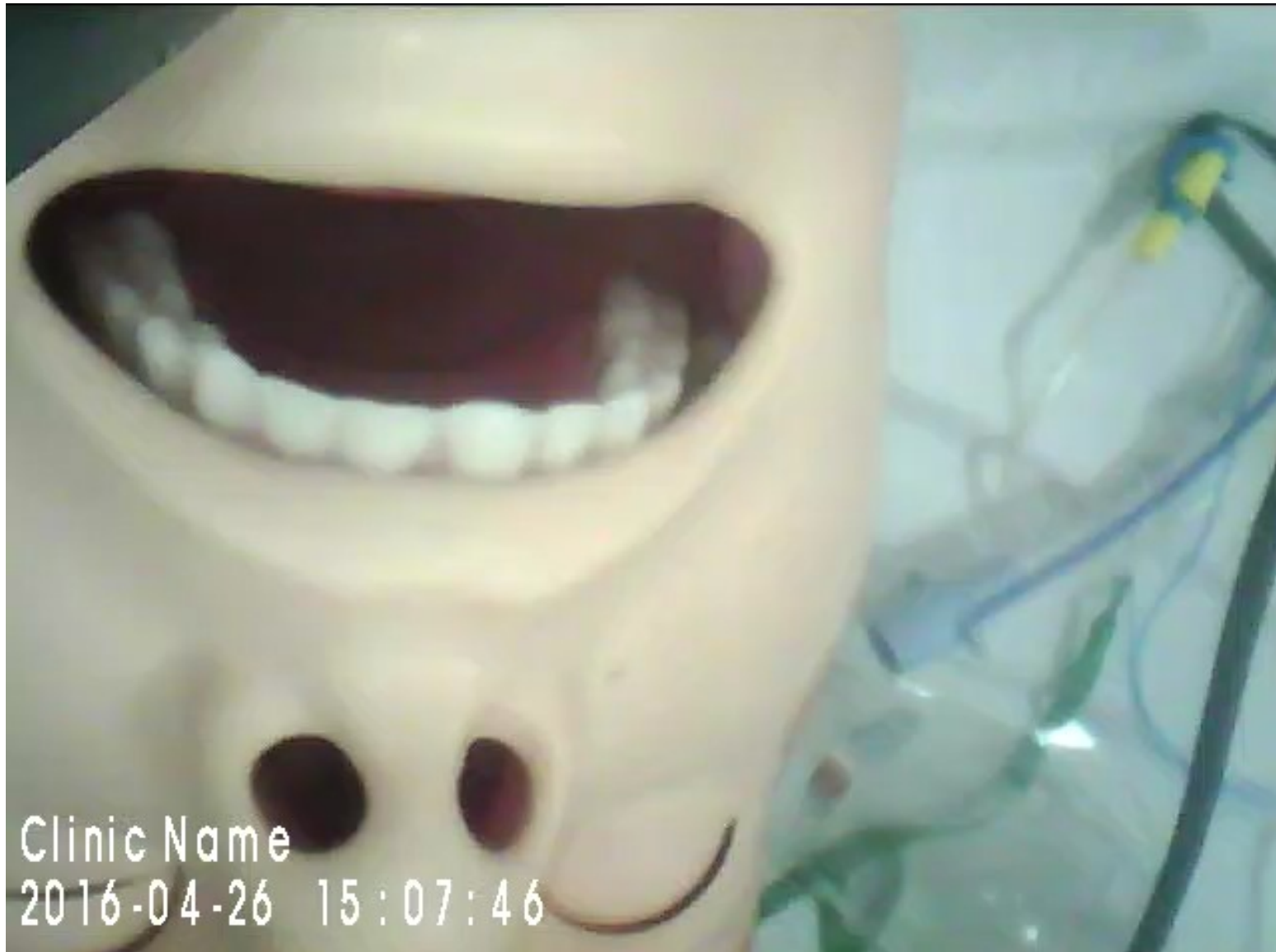


# Bougie





# Intubation via Bougie



# *RSI*

- Rapid Sequence of Intubation
- Rapid Sequence of Induction



# *RSI indication*

I: increased risk of aspiration

- full stomach
  - unknown time of starving
  - gastroparesis
  - analgetics
  - diabetes
- GE reflux

# *RSI - sequence*

- Preox + i.v. line, working suction
  - induction = propofol, SchJ
  - Sellick maneuver + OTI
  - confirmation
  - fixation by tape
  
  - be ready for 2 l of gastric content
  - Sellick maneuver continues until tube is in place and balloon is cuffed
- 
-

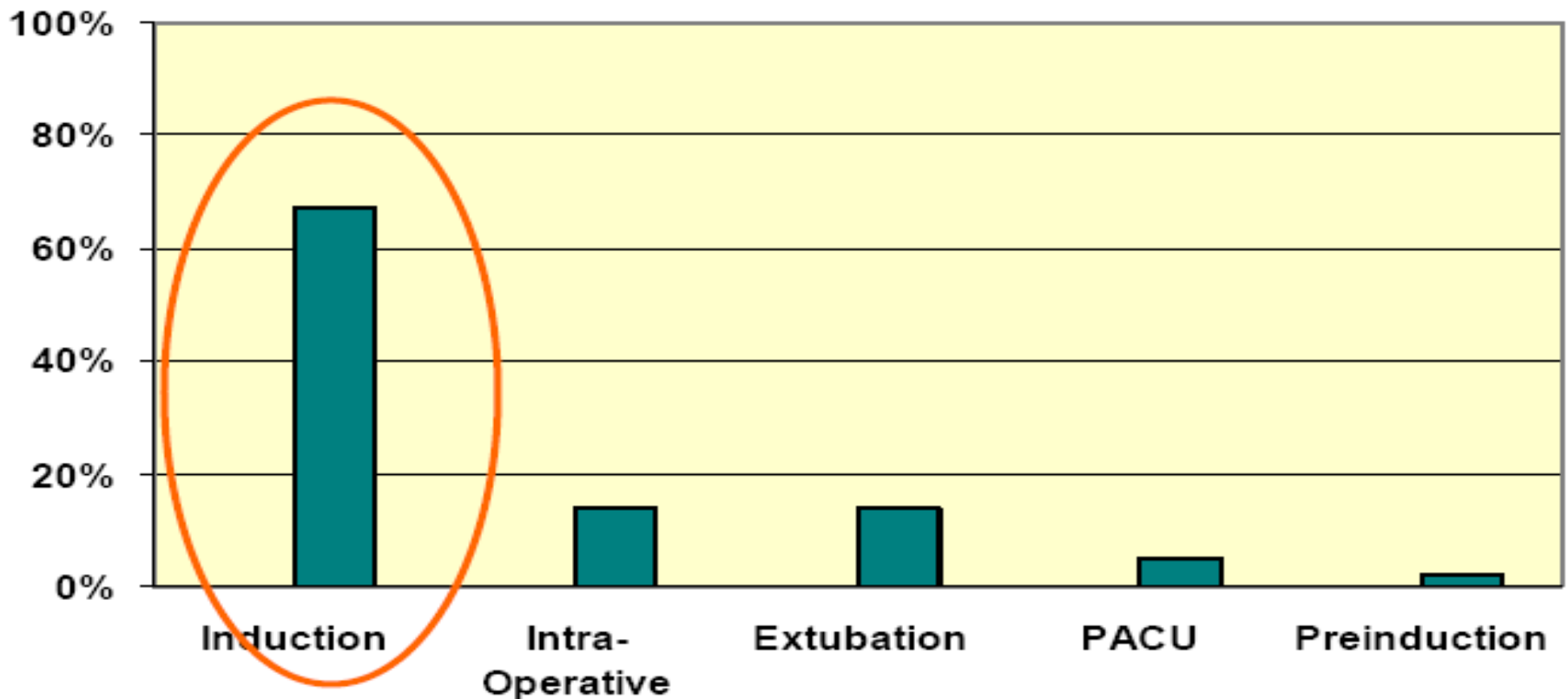
# *Difficult Airway*

- Anticipated
  - awake intubation – bronchoscope
  - (TS)
- Unanticipated
  - spont. vent. / paralyzed



# Time of Airway Events

## Timeline of Airway Events



Reference: *Management of the Difficult Airway in Closed Malpractice Claims*  
By Peterson et al. (University of Washington)



# *Alternative Equipment*

Better view: → intubation

- VideoLaryngoscopy
- Fastrach LMA
- fibroscope



What to do for survival?

- O<sub>2</sub>, ventilation
- call for help early + have a plan



# *Cannot intubate, can ventilate*

- call for help
- keep ventilation



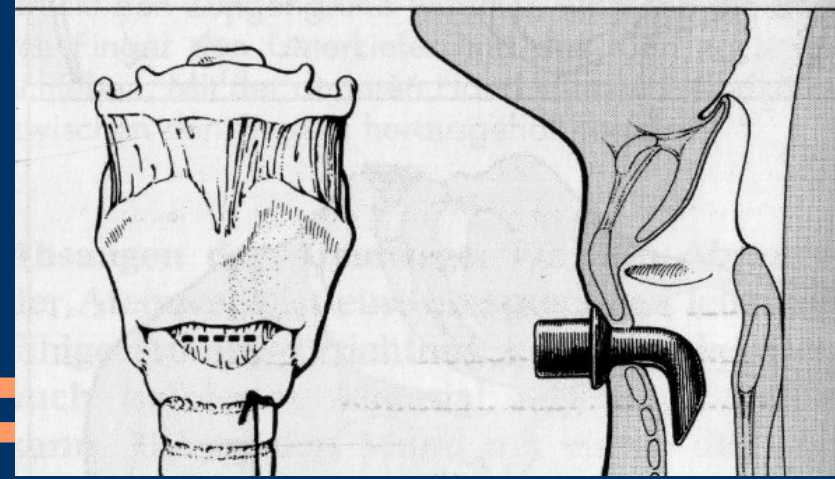
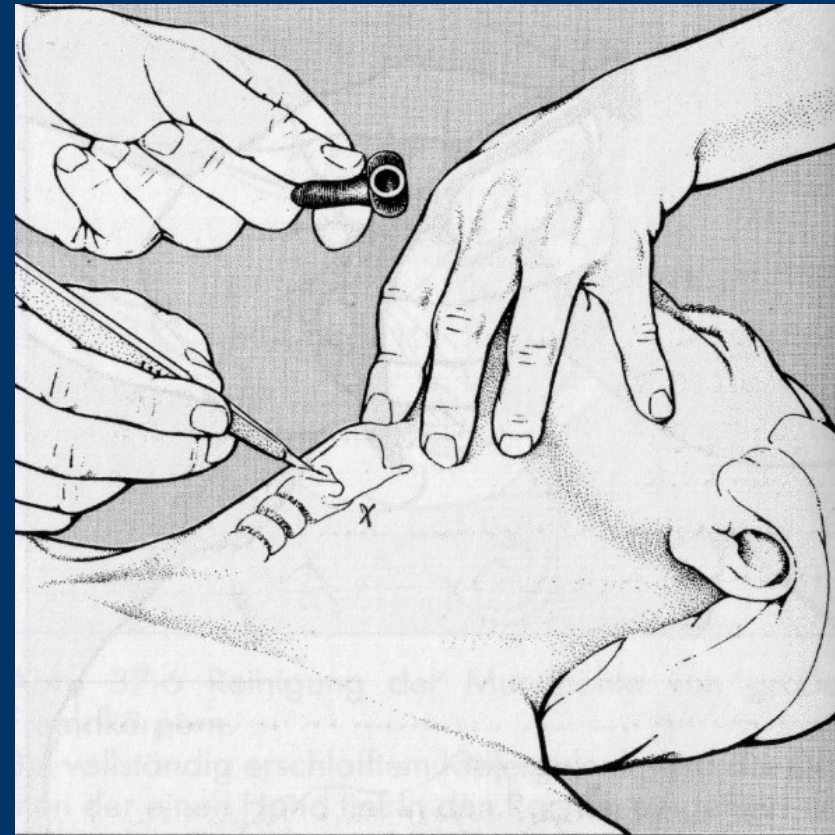
# *Can not ventilate, can not intubate*

- Call for Help
- try 3 nonsurgical techniques
- awake as soon as possible (no more drugs .. awakening)
- perform surgical airway

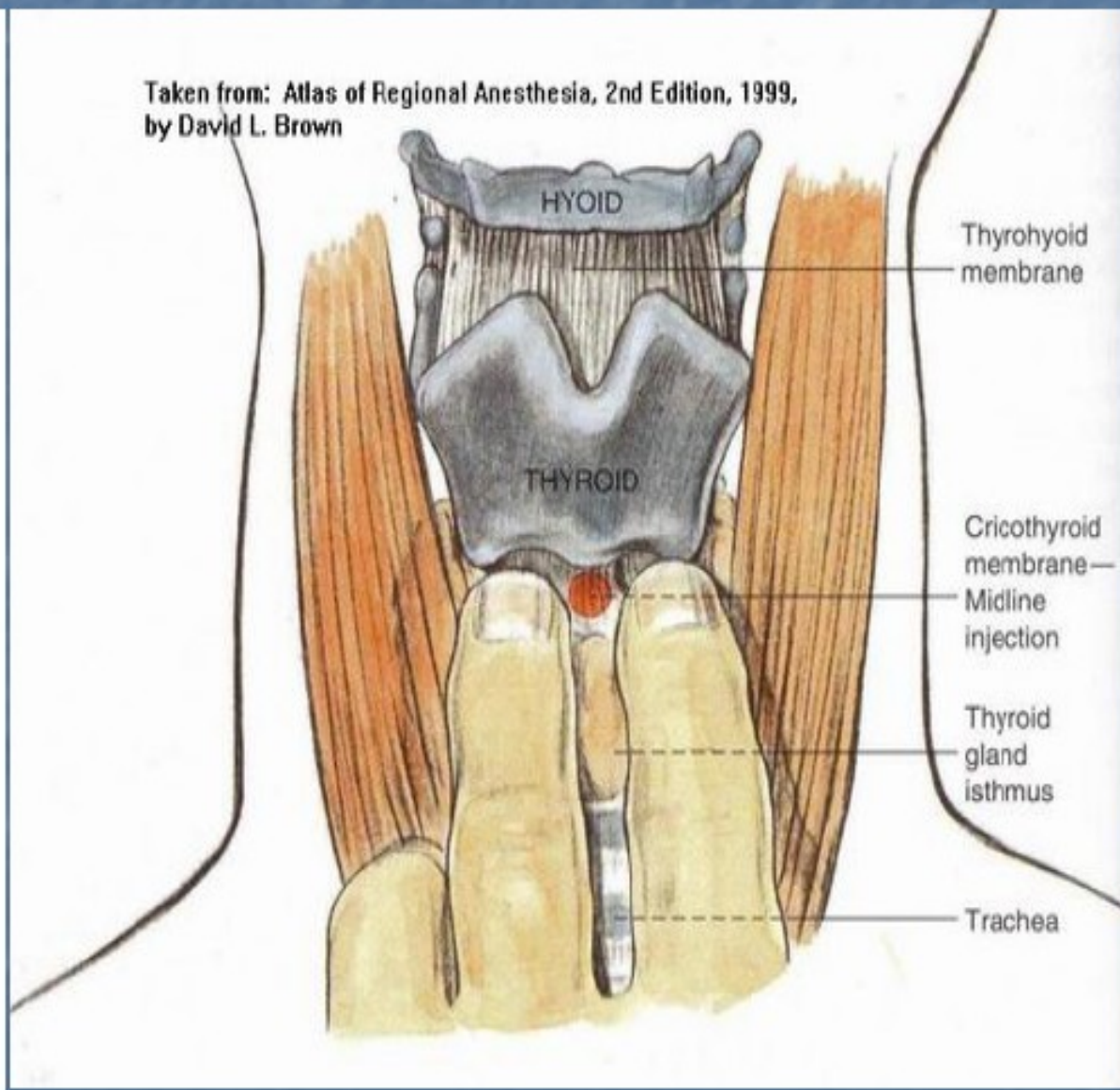
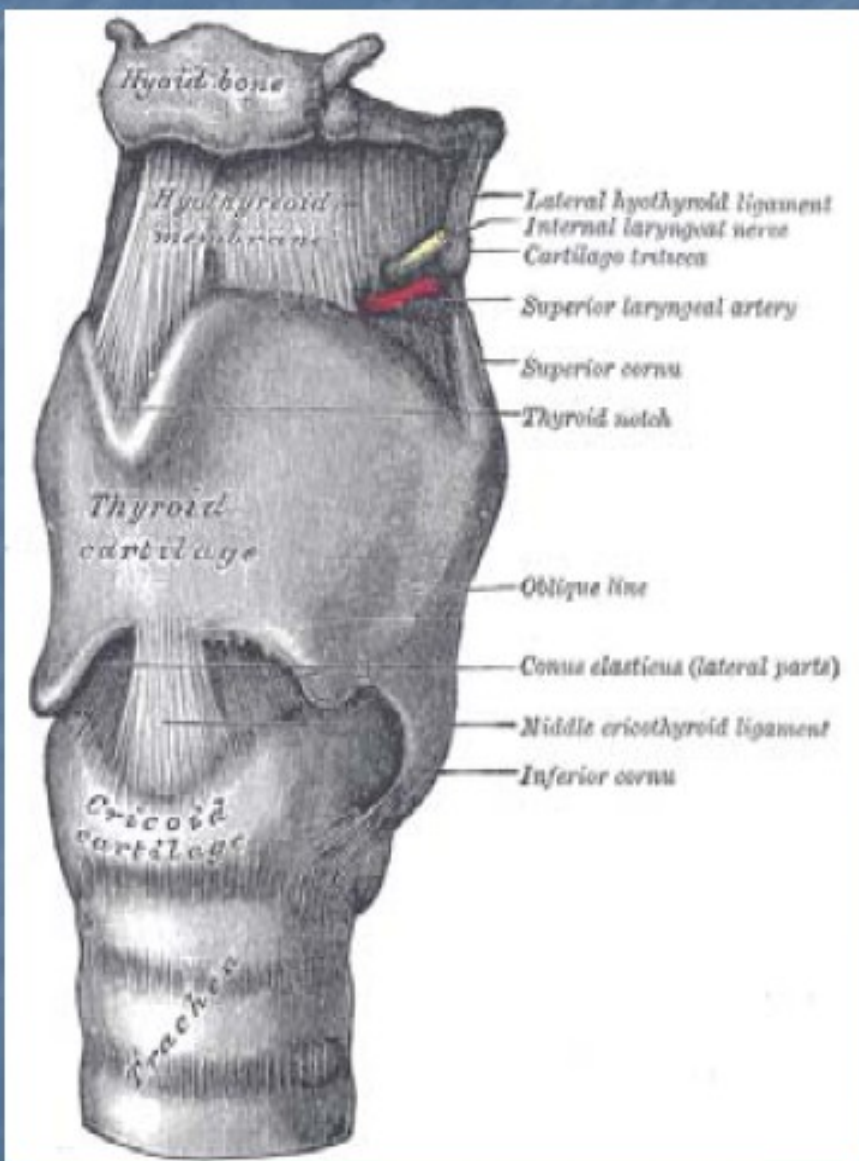


# Coniotomy

- urgent access to airway
- lig. cricothyreoideum (lig. conicum)



# Where is the Cric Membrane ?



# *Coniotomy*

- First try OTI
- find the ligament
- DO it.



# Minitrach



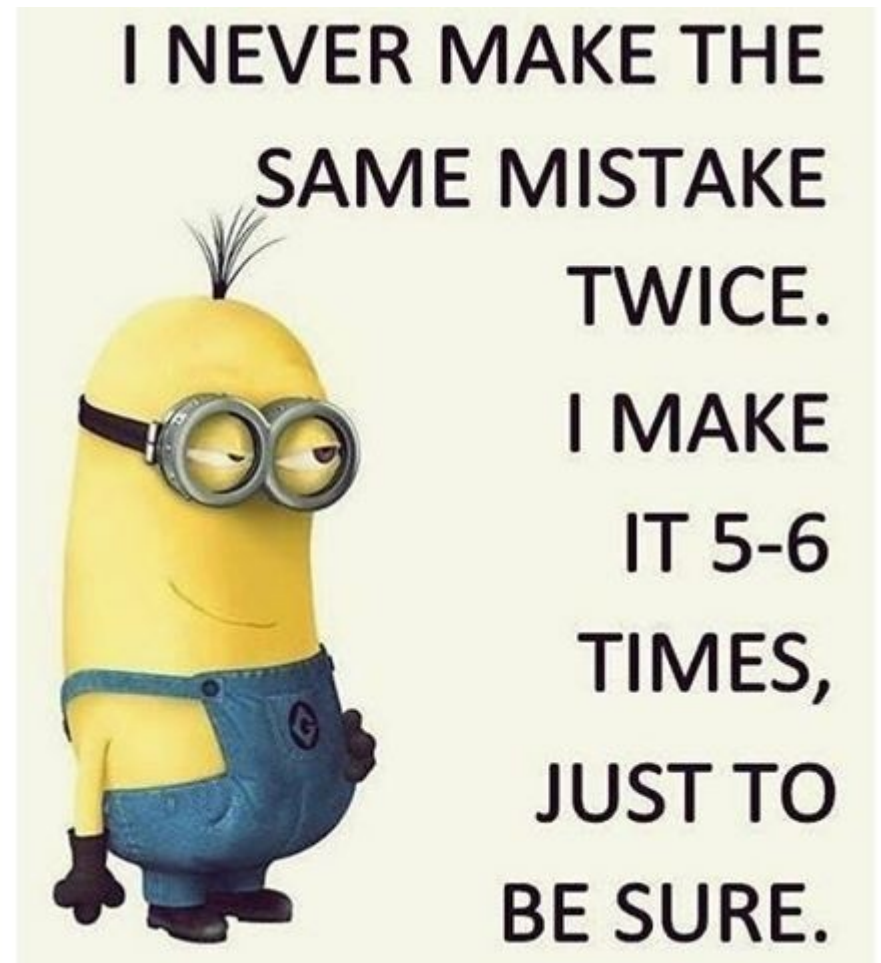
# BACT



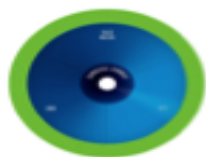


# Mind in a stressful event

- When you do the same thing twice, it usually leads to the same result



# Na 2. pokus něco změní

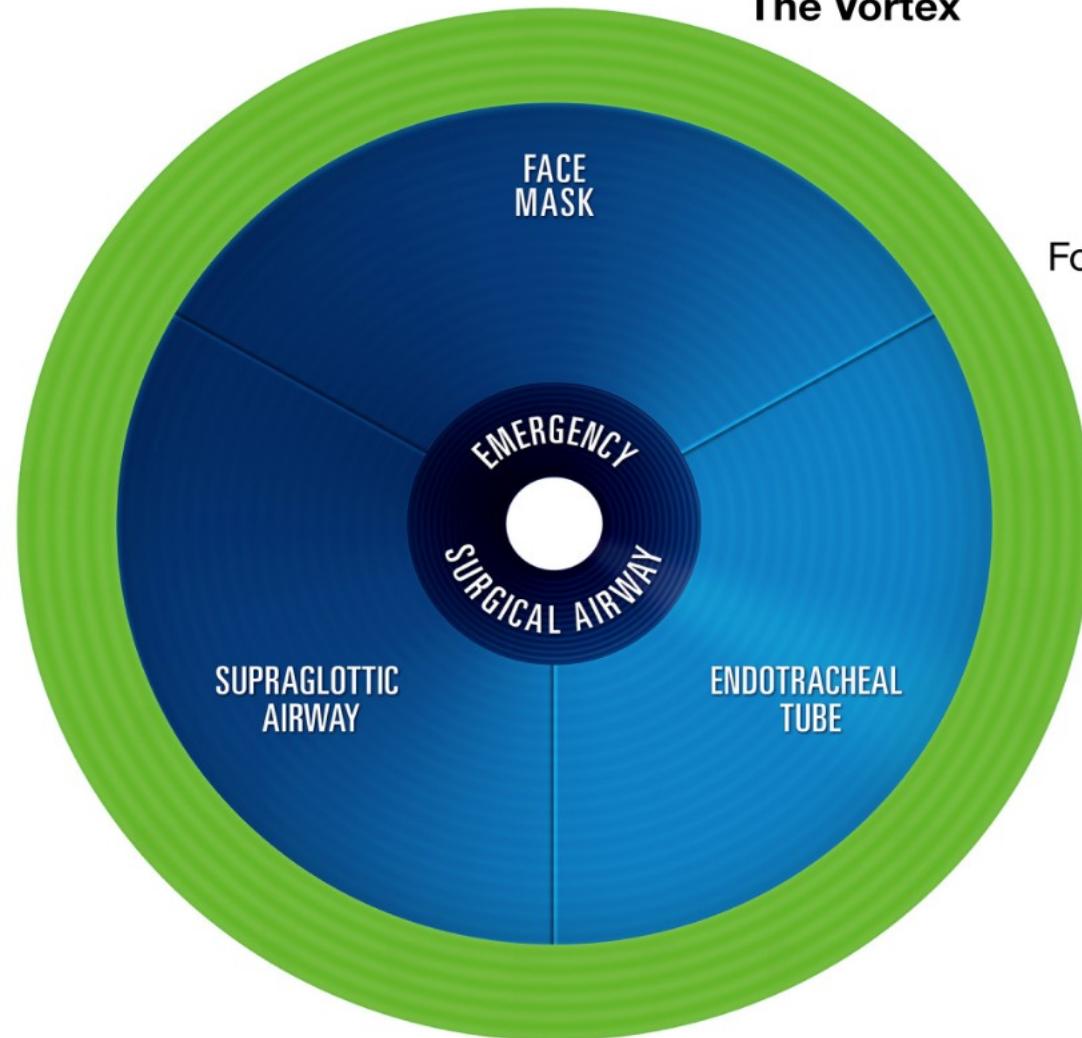


## VORTEX OPTIMISATION STRATEGIES

	FACE MASK	LARYNGEAL MASK AIRWAY	ENDOTRACHEAL TUBE
<b>1. Manipulation Head &amp; Neck</b>	Sniffing Position/Jaw Thrust/Bed Height		
	Dentures In		Dentures Out
Larynx	Laryngeal Manipulation (incl. ease cricoid)		
Device	2 hands	Twist Cuff Inflation	Rotate
<b>2. Adjuncts</b>	OPA NPA	Introducer Bougie Laryngoscope	Stylette Bougie Magill Forceps
<b>3. Size/Type</b>	FM	LMA	Blade/Handle/VL ETT
<b>4. Suction</b>			
<b>5. Pharyngeal Muscle Tone</b>	Prospect of recovery: consider reverse BZD's, opioids, NMBD's GZ or No prospect recovery: consider adequacy anaesthesia/m. relaxation		

# Only 3+1 ways of A.M.

## The Vortex



### For Each NSA Technique Consider:

1. Manipulations:
  - Head & Neck
  - Larynx
  - Device
2. Adjuncts
3. Size/Type
4. Suction/O<sub>2</sub> Flow
5. Muscle Tone

**MAXIMUM THREE TRIES AT EACH NON-SURGICAL AIRWAY TECHNIQUE  
AT LEAST ONE TRY SHOULD BE HAD BY MOST EXPERIENCED AVAILABLE CLINICIAN**



vortexapproach.org

# Summary – Difficult Airway

- Preop exam – allways
- History
- ready to awake intubation = fibroscopic OTI
- Have a plan
- Surgical access takes max 90 s

# Extubation:

- contact [open eye, mouth...]
- clear oropharynx  
(secretions, stopped bleeding)
- Patient keeps head 5s above bed / hand grip
- good pain control
- minimal ET concentration of anaesthetic agents