

# Risk Factors for Difficult Airway Response Team Patients

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# Risk Factors for Difficult Airway Response Team Patients

Angioedema

Active airway bleeding

Head and neck tumor

History of difficult airway

Limited cervical spine mobility

Tracheotomy and laryngectomy

Body mass index >30

# Difficult Airway Intubation and Airway Devices

**TABLE 5.1** Difficult Airway/Intubation: Advances in Airway Devices

Technique	Visualization	Site	Awake/ Asleep	Contraindications	Use by OLHN	Use by Anesthesiology	Comments
Facemask	None	Oral	Both	Full stomach	–	+	To optimize nasal/oral airways, headstrap
Video-assisted laryngoscopy	Indirect	Oral	Both	Limited jaw opening	+	+	Variations include C-Mac, GlideScope, McGrath
Supraglottic airway devices	None	Oral	Both	Full stomach	–	+	Variations include LMA, ILMA, flexible LMA, ProSeal, Air-Q, Fastrach
Blind nasal	None	Nasal	Both	Nasal pathology, coagulation status	–	+	
Digital	None	Oral	Both	Limited jaw opening	–	+	
Lighted stylet	None	Oral, nasal	Both	Nasal or laryngeal pathology, large neck/mass	–	+	Requires transillumination at sternal notch
Conventional laryngoscopy	Direct	Oral	Both	Limited jaw opening	–	+	Macintosh/Miller blades
Endotracheal tube guides (Eschmann, Frova, Arndt, Aintree)	Direct or none	Oral, nasal	Both		+	+	Adjunct to conventional and rigid laryngoscopy intubation with LMA and extubation techniques
Rigid laryngoscopy (Hollinger, Dedo)	Direct	Oral	Both	Severely limited jaw opening	+	–	Laryngoscope commonly used for difficult airway intubation
Rigid bronchoscopy	Direct	Oral	Both	Severely limited jaw opening	+	–	
Fiberoptic bronchoscopy	Direct	Both	Both	Blood or oral secretions	–	+	
Rigid fiberoptic laryngoscope (Bullard, Usher)	Indirect	Oral	Both	Blood or oral secretions	–	+	Combination of fiberoptic and conventional laryngoscopy

# Difficult Airway Intubation(cont..)

Blind nasal	None	Nasal	Both	Nasal pathology, coagulation status	–	+	
Digital	None	Oral	Both	Limited jaw opening	–	+	
Lighted stylet	None	Oral, nasal	Both	Nasal or laryngeal pathology, large neck/ mass	–	+	Requires transillumination at sternal notch
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Fiberoptic bronchoscopy	Direct	Both	Both	Blood or oral secretions	–	+	
Rigid fiberoptic laryngoscope (Bullard, Upsher, Wu)	Indirect	Oral	Both	Blood or oral secretions	–	+	Combination of fiberoptic and conventional laryngoscopy
Retrograde intubation	Indirect	Neck	Both		+	+	
Percutaneous cricothyroidotomy	Indirect	Neck	Both	Neck pathology, technique	+	+	OLHN assisted with FOB/direct visualization
Cricothyroidotomy	Direct	Neck	Both	Neck pathology, technique	+	–	
Tracheotomy	Direct	Neck	Both	Neck pathology, technique	+	–	

# Component of Airway Physical Examination

- Visual inspection of the face and neck
- Assessment of mouth opening
- Evaluation of oropharyngeal anatomy and dentition
- Assessment of neck range of motion (ability of the patient to assume the sniffing position)
- Assessment of the submandibular space
- Assessment of the patient's ability to slide the mandible anteriorly (test of mandibular prognathism)

# Mouth Opening(Scissoring Technique)



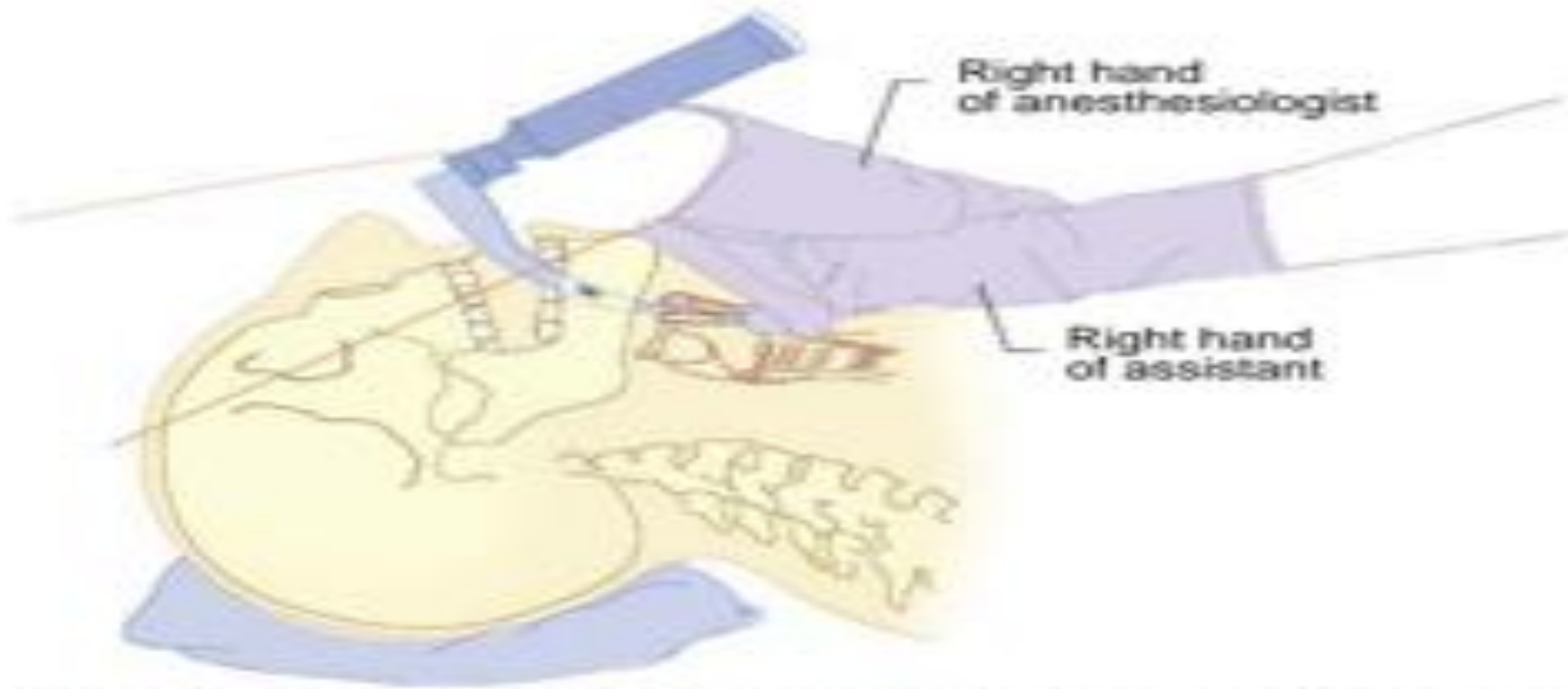
Frontal view



Lateral view

**Fig. 44.19** The scissors technique for mouth opening. The thumb of the right hand is pressed on the right lower molars in a caudad direction while the index or third finger of the right hand presses on the right upper molars in a cephalad direction. (From Baker PA, Timmer-

## External Laryngeal Manipulation(BUR Pressure )



**Fig. 44.22** Optimal external laryngeal manipulation. The laryngoscopist guides the position, and pressure is exerted by the assistant's hand on the larynx to maximize the view of the vocal cords. The left hand of the laryngoscopist, which holds the laryngoscope handle, is omitted. (From Henderson J. Airway management. In: Miller RJ, ed. *Anesthesia*, 7th ed. Philadelphia: Churchill Livingstone; 2009.)

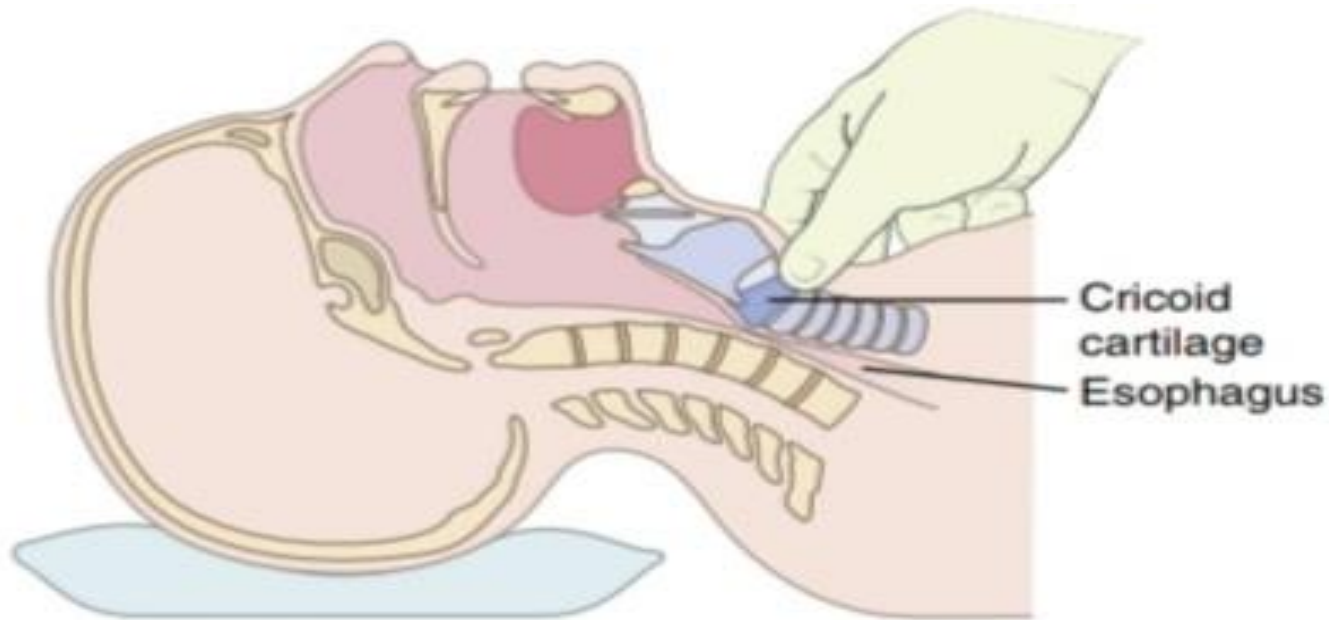


# Cricoid Pressure (Sellick Maneuver)

- ▶ Application in patients with increased risk of Regurgitation of Gastric content : compression of Esophagus , Hypopharynx
- ▶ Can be released if it impedes Oxygenation, Ventilation , or view of glottis opening
- ▶ Complication : Relaxation of LES which can favor Regurgitation, Esophageal rupture,



# Rapid Sequence Induction (RSI) With Cricoid Pressure For Prevention of Aspiration



**Fig. 16.18** Cricoid pressure is provided by an assistant exerting downward pressure with the thumb and index finger on the cricoid cartilage (approximately 5-kg pressure) so that the cartilaginous cricothyroid ring is displaced posteriorly and the esophagus is thus compressed (occluded) against the underlying cervical vertebrae.

# NPO Time( Fasting Recommendation)

- ▶ Clear Liquid : 2 Hours
- ▶ Breast milk : 4 Hours
- ▶ Other food , Beverages , Infant Formula and Milk : 6 Hours
- ▶ Delayed Gastric Emptying ( GOO , Diabetic Gastro paresis, ..): further Fasting time to reduce risk of Aspiration
- ▶ Aspiration :One of the most common cause of death among major anesthesia complication

# Pulmonary Aspiration

**TABLE 27-11. PULMONARY ASPIRATION (A) PATIENTS AT RISK FOR ASPIRATION, (B) ASA RECOMMENDED FASTING GUIDELINES, (C) METHODS TO REDUCE RISK**

**(A) Patients at risk for aspiration**

Full stomach (recent ingestion)  
Diabetes mellitus (with peripheral neuropathy)  
Gastroesophageal reflux/hiatal hernia  
Pregnancy  
Acute pain/acute opioid therapy renal colic  
Bowel obstruction/intra-abdominal process

**(B) Summary of fasting recommendations (WR-BB)**

Ingested material	Minimum fasting period
Clear liquids	2 h
Breast milk	4 h
Infant formula	6 h
Nonhuman milk	6 h
Light meal	6 h

**(C) Methods to reduce risk**

Minimize intake, adequate preoperative fasting, clear liquids only if necessary  
Increase gastric emptying, prokinetics (e.g., metoclopramide)  
Reduce gastric volume and acidity, Nasogastric tube, nonparticulate antacid (e.g., sodium citrate),  
H<sub>2</sub>-receptor antagonists (e.g., famotidine), proton pump inhibitors (e.g., lansoprazole)  
Airway management and protection, cricoid pressure, cuffed endotracheal intubation

# Curved and Straight Blade

- ▶ Straight Blade :  
in Patient with Short Thyromental distance , Prominent Incisors and Better View in Long Floppy Epiglottis and better control of Tongue and Epiglottis
- ▶ Curved Blade : Greater Mouth View and Less Dental Trauma

# ETT , suction Catheter, and Stylet Size Based on Age and Weight

Age (yr)	Weight (kg)	Endotracheal Tube ID (mm)	Suction Catheter (F)	Stylet (F)
Premature	<1.5	2.5	6	6
Premature	1.5-2.5	3.0	6	6
Newborn	3.5	3.5	8	6
1	10	4.0	8	6
2-3	15	4.5	10	6
4-6	20	5.0	10	10
7-9	30	5.5	12	10
10-12	40	6.0	14	10
13-15	50	6.5	14	14
>16	>60	7.0	18	14

# ETT Size and Length

Age	Internal Diameter (mm)	Distance from Lips to Midtrachea <sup>a</sup> (cm)
Premature	2.5	8
Full term	3	10
1–6 mo	3.5	11
6–12 mo	4	12
2 yrs	4.5	13
4 yrs	5	14
6 yrs	5.5	15
8 yrs	6.5	16 <sup>b</sup>
10 yrs	7	17–18 <sup>c</sup>
12 yrs	7.5	18–20
14 yrs	8–9	20–22

<sup>a</sup>Add 2 to 3 cm for nasal tubes.

<sup>b</sup>Females.

<sup>c</sup>Males.

# ETT Size for Age

**Table 34.4** Oral Endotracheal Tube (ETT) Size for Age

Age Group	Uncuffed ETT Size (ID mm)	Cuffed ETT Size (ID mm)
Preterm	2.5-3.0	NA
Term	3.0-3.5	3.0-3.5
1-6 months	3.5	3.5
7-12 months	4.0	3.5-4.0
1-2 years	4.5	4.0-4.5
3-4 years	4.5-5.0	4.5
5-6 years	5.0-5.5	4.5-5.0
7-8 years	NA	5.0-5.5
9-10 years	NA	5.5-6.0
11-12 years	NA	6.0-6.5
13-14 years	NA	6.5-7.0
14+ years	NA	7.0-7.5

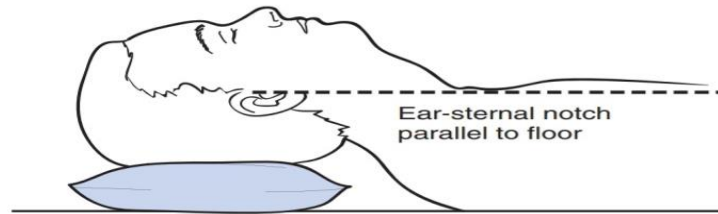
Depth of insertion:  
Multiplying the ID of the ETT by 3 yields the proper depth of insertion to the lips, in cm. *Example: 4.0 mm ETT  $\times$  3 = 12 cm for depth of insertion.*

ID, Inner diameter.

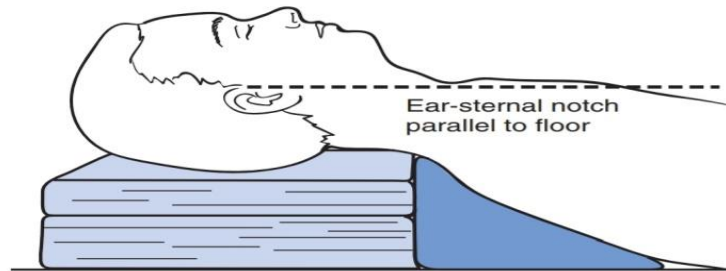


# Ramping for Airway Management in Obesity

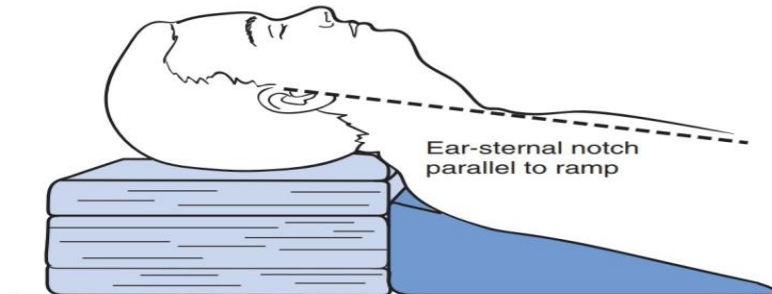
A Supine with correct sniffing position



B Ramp with incorrect sniffing position

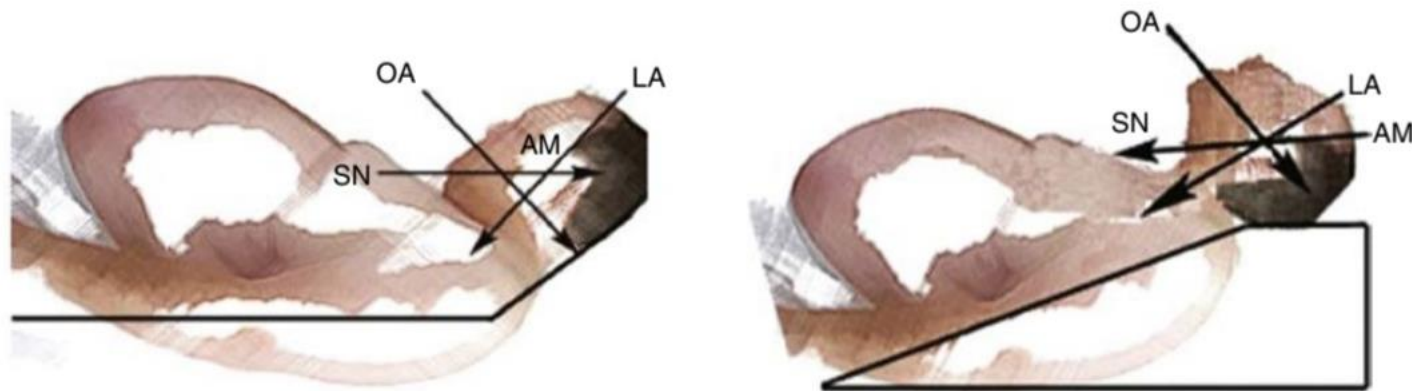


C Ramp with correct sniffing position



Proper ramp positioning. (A) Proper sniffing position (alignment of airway axes by flexing the neck and extending the head to align the oral, pharyngeal and laryngeal axes) is said to occur when an imaginary line connecting the ear to sternal notch is parallel to the

# Ramping for Airway Management in Obesity



**FIG. 20.4** "Ramping" to achieve proper positioning for airway management. AM, Auditory meatus; LA, laryngeal axis; OA, oral axis; SN, sternal notch. (Illustration by Brooke E. Albright, MD.)

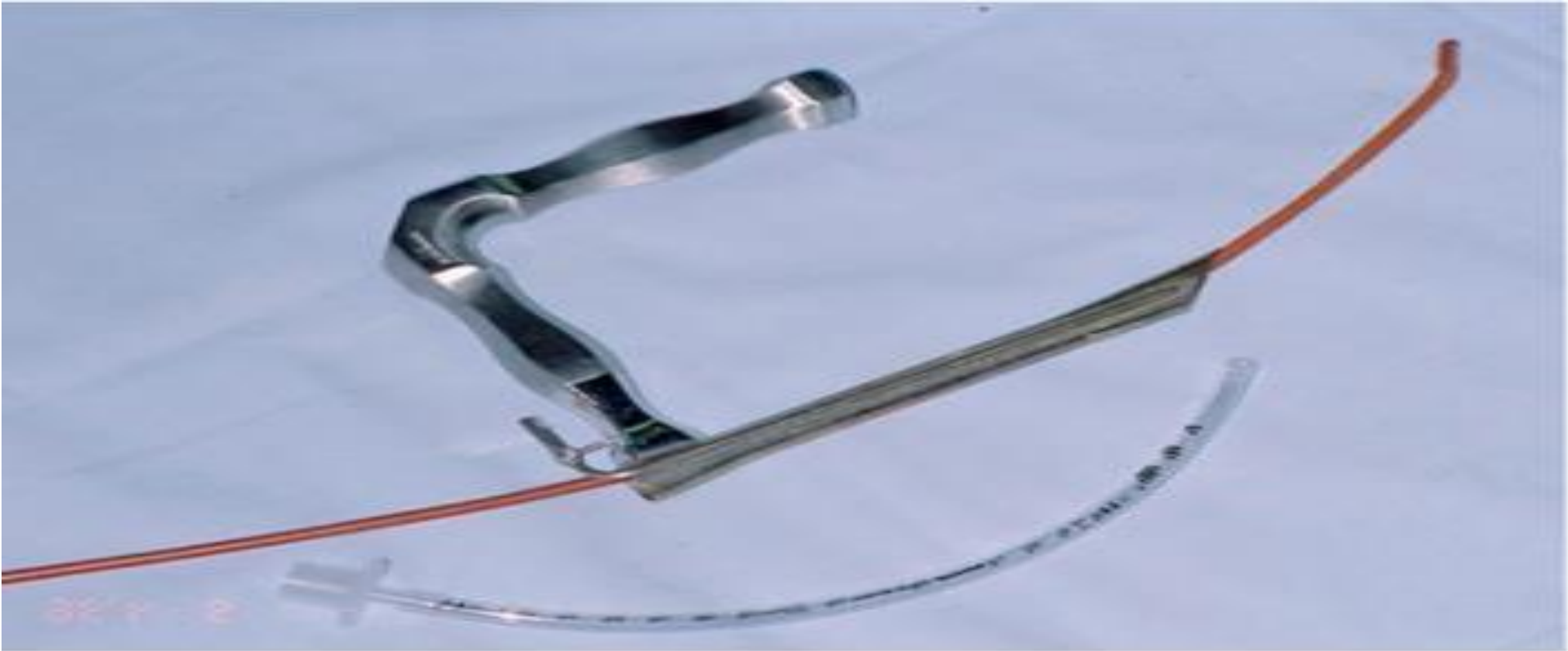
# Cont..



**FIGURE 44-5.** Ramped position with “stacking” of towels and blankets.

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# Hollinger Laryngoscope



**5.6 Hollinger with gum elastic bougie (Eschmann) and 5.0uffed endotracheal tube.** Current recommendations are foruffed endotracheal tubes. (Courtesy Johns Hopkins Medicaltutions, Baltimore, MD.)

# Hollinger Laryngoscope Placement with a Tooth Guard

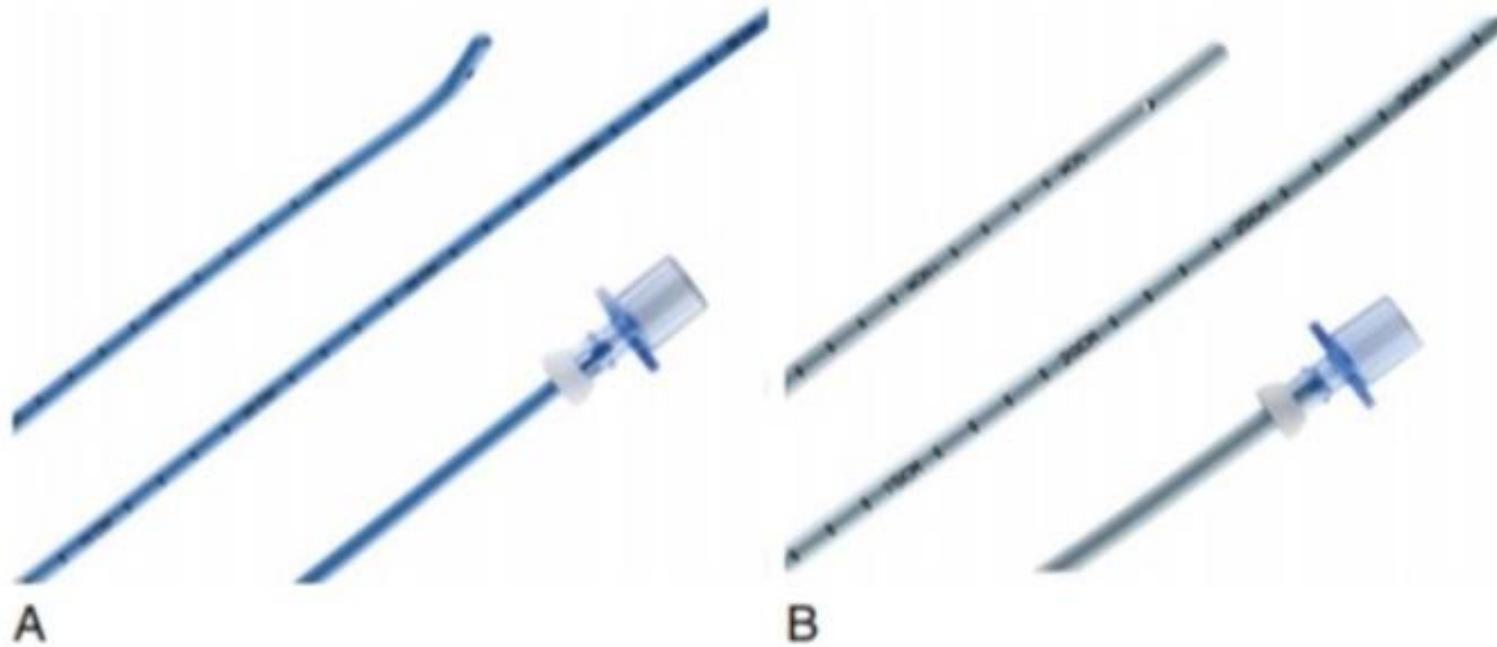




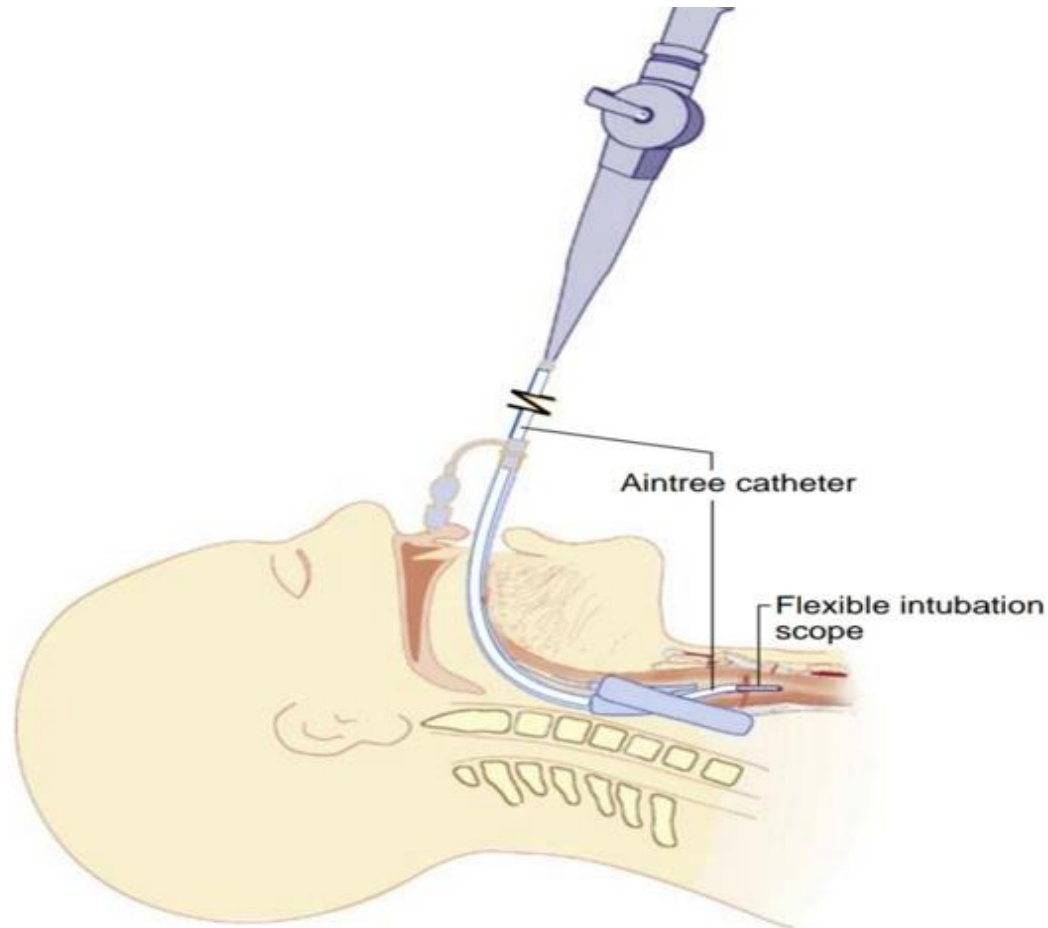
(A) Frova Intubating Introducer

(B) Aintree Intubation Catheter

complication: bleeding , oropharyngeal trauma , tracheal trauma , sore throat

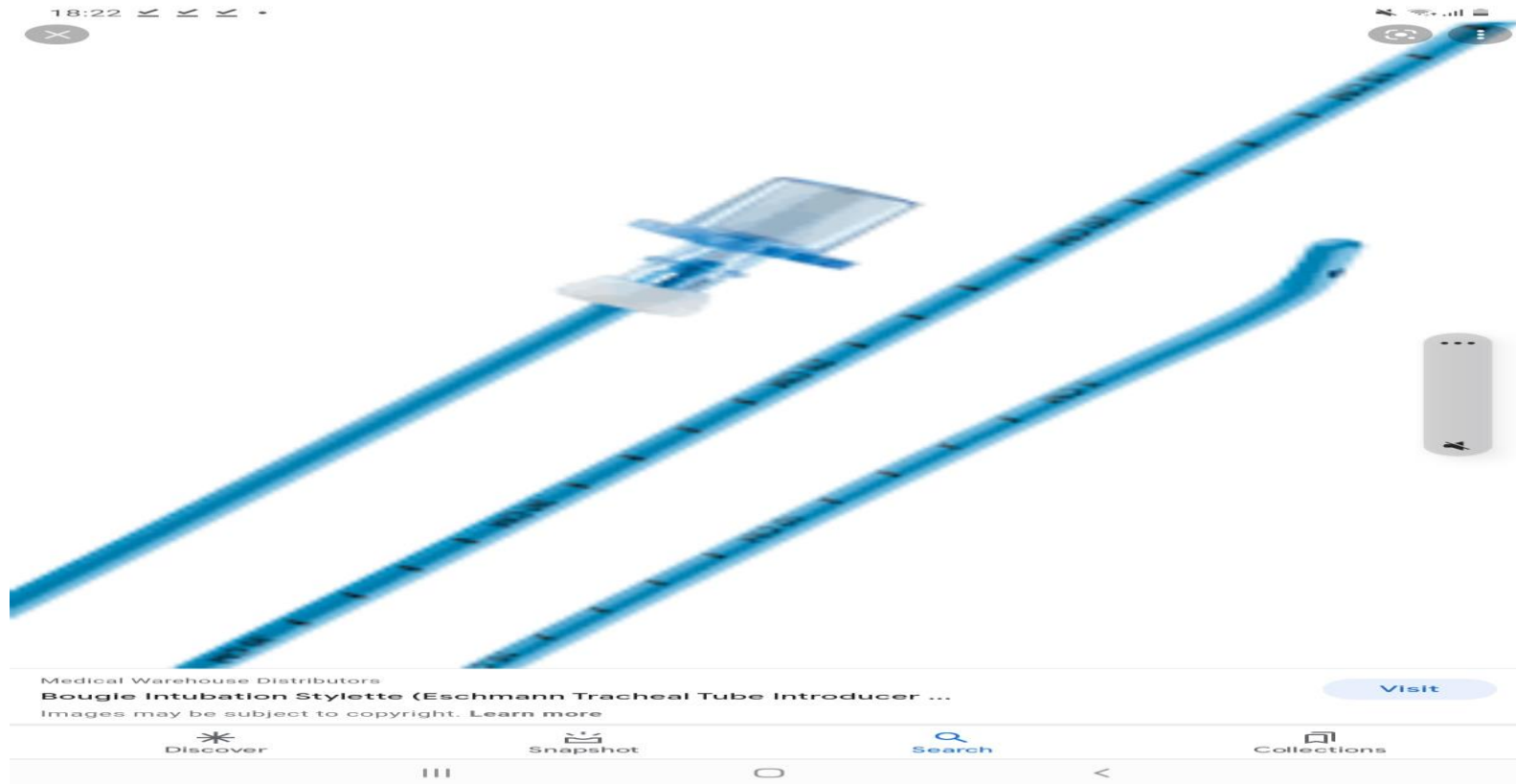


# Aintree Intubating Catheter Within a Flexible Intubation Scope, Inserted Through LMA





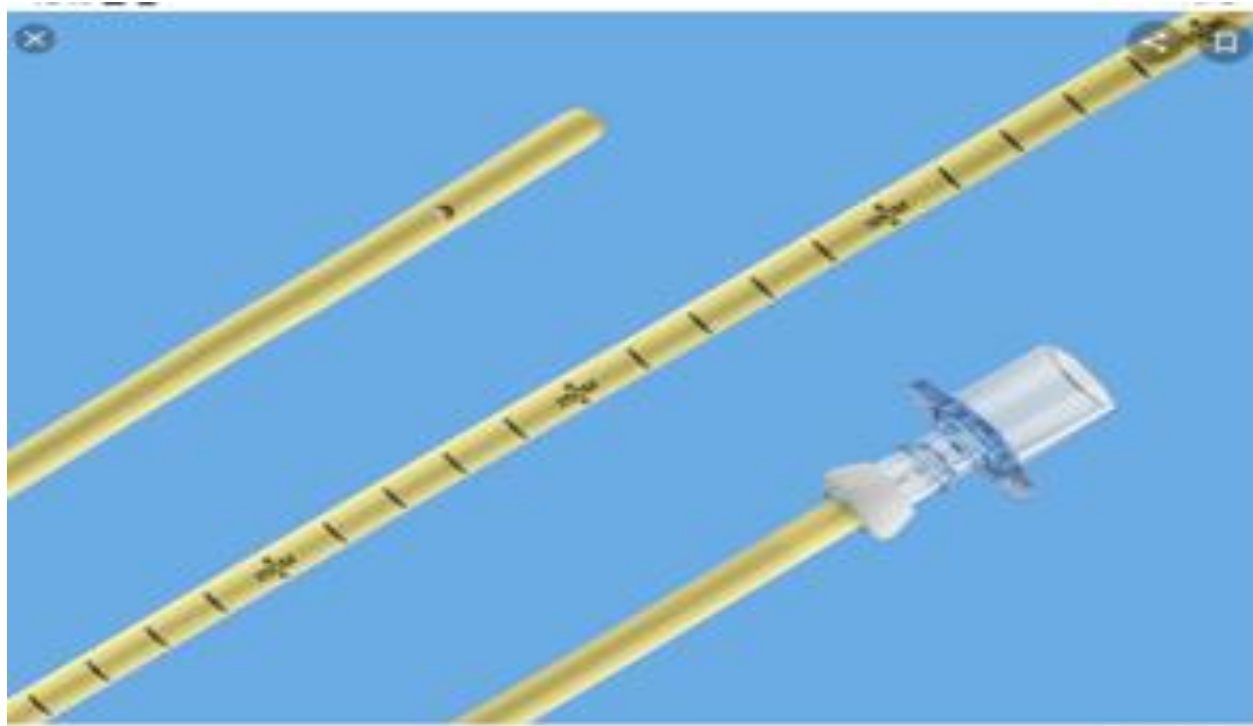
# Bougie Intubation Stylet ( Eschmann Tracheal Tube Introducer)



# Coude Tip Catheter of Rusch Tiemann



# Airway Exchanger Catheter of Cook complication : Trachea/Bronchial laceration



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Cook® Airway Exchange Catheters – Obex

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# Airway Exchange Catheter(AEC)

airway conduit to assist reintubation



**FIGURE 27-18.** Marking of an airway exchange catheter (AEC) are aligned with the markings on the *in situ* tracheal tube. By aligning these marks as the AEC is inserted prevents bronchial trauma.

# Discrepancy between an Airway Exchange Catheter and a Re-inserted Tracheal Tube



**FIGURE 27-19.** Size discrepancy between an airway exchange catheter and a re-inserted tracheal tube can create defects which can trap tissues and hinder intubation.

# ETT Stylets , Introducers , and Airway Exchange Catheters

- ▶ Stylet: is used to stiffen and provide curvature to an ETT, after stylet placement through the lumen of an ETT , the tube can be bent into the desired shape , the tip of stylet should not protrude past the end of the ETT
- ▶ Gum Elastic Bougie : Is a solid 60-cm long , 15-F stylet with a 40 degree curve approximately 3.5 cm from the distal tip, used to facilitate intubation in patient with poor laryngoscopic view
- ▶ Frova Intubating Introducer: stylet with distal angulated tip and an internal channel to accommodate a stiffening rod or allow jet ventilation and used for poor laryngoscopic view
- ▶ Aintree intubation catheter : the AIC has large ,4.7 -mm lumen and two adapter , one for jet ventilation , and the other for connection to anesthesia circuit or Ambu bag and also can be used to exchange supraglottic airways to ETT ,AIC threaded into a fiberoptic bronchoscope



# Complication of Endotracheal intubation

## **Box 16.2 Complications of Endotracheal Intubation**

### **During Direct Laryngoscopy and Endotracheal Intubation**

- Dental and oral soft tissue trauma
- Systemic hypertension and tachycardia
- Cardiac dysrhythmias
- Myocardial ischemia
- Inhalation (aspiration) of gastric contents

### **While the Endotracheal Tube Is in Place**

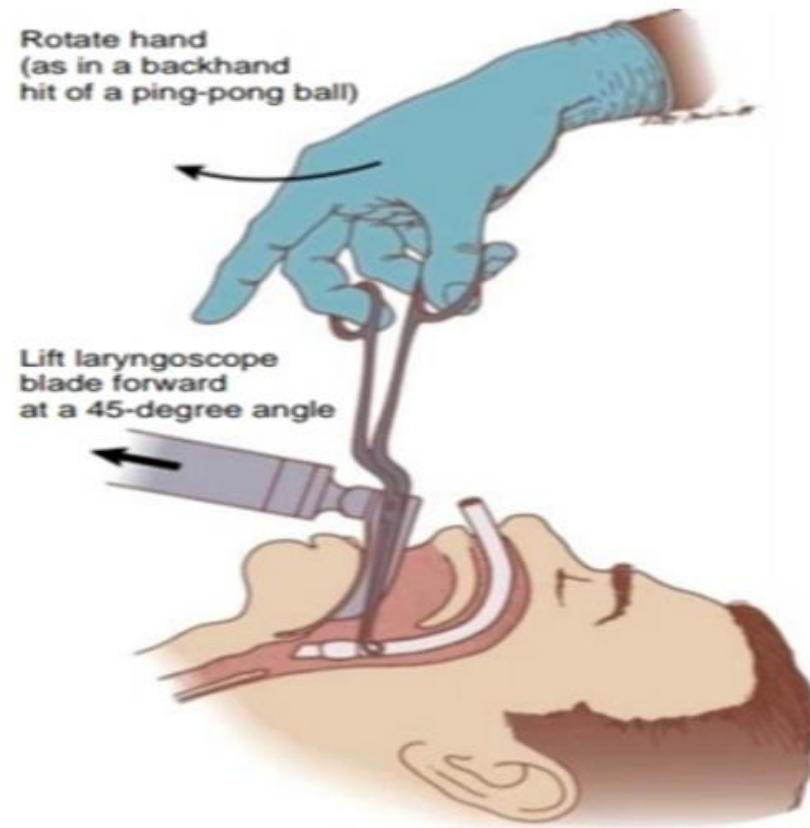
- Endotracheal tube obstruction
- Endobronchial intubation
- Esophageal intubation
- Endotracheal tube cuff leak
- Pulmonary barotrauma
- Nasogastric distention
- Accidental disconnection from the anesthesia breathing circuit
- Tracheal mucosa ischemia
- Accidental extubation

### **Complications After Endotracheal Extubation**

- Laryngospasm
- Inhalation (aspiration) of gastric contents
- Pharyngitis (sore throat)
- Laryngitis
- Laryngeal or subglottic edema
- Laryngeal ulceration with or without granuloma formation
- Tracheitis
- Tracheal stenosis
- Vocal cord paralysis
- Arytenoid cartilage dislocation



# Guiding a Nasal ETT Into Larynx with Magill Forceps



# Blind Naso Tracheal Intubation

- ▶ Vasoconstriction and Anesthesia of Nasal Mucosa to minimize Bleeding and Discomfort
- ▶ ETT size 6.0 to 7.0 mm ID is Chosen in Adult
- ▶ Advancing ETT through the Nose and into the Pharynx while Listening to Breath Sound at the Distal end of ETT
- ▶ ETT can be attached to an Anesthesia Breathing Circuit for monitoring of Reservoir Bag movement and Carbon Dioxide
- ▶ If Tugging is seen on the Anterior Surface of the Neck . ETT is loading in the Vallecula and Rotating the Tube to Free it from the Epiglottis can be Advantageous
- ▶ If Evidence of Breathing through ETT Disappears , the ETT has advanced into Esophagus , ETT should be withdrawn back to a depth where breathing occurs , Cuff can be inflated with air to lift it off the posterior Pharyngeal Wall ,then advancing until slight resistance is felt, Cuff is Deflated and ETT is advanced further into the Trachea

## Awake intubation

Airway approached by noninvasive intubation

Invasive airway access<sup>(b)\*</sup>

Succeed\*

Fail

Cancel case

Consider feasibility of other options<sup>(a)</sup>

Invasive airway access<sup>(b)\*</sup>

## Intubation after induction of general anesthesia

Initial intubation attempts successful\*

Initial intubation attempts **unsuccessful**

**From this point onward, consider:**

1. Calling for help
2. Returning to spontaneous ventilation
3. Awakening the patient

Facemask ventilation adequate

Facemask ventilation not adequate

Consider/attempt SGA

SGA adequate\*

SGA not adequate or not feasible

**Nonemergency pathway**  
Ventilation adequate, intubation unsuccessful

**Emergency pathway**  
Ventilation not adequate, intubation unsuccessful

Alternative approaches to intubation<sup>(c)</sup>

**If both facemask and SGA ventilation become inadequate**

Call for help

Emergency noninvasive airway ventilation<sup>(e)</sup>

Successful intubation\*

Fail after multiple attempts

Successful ventilation\*

Fail

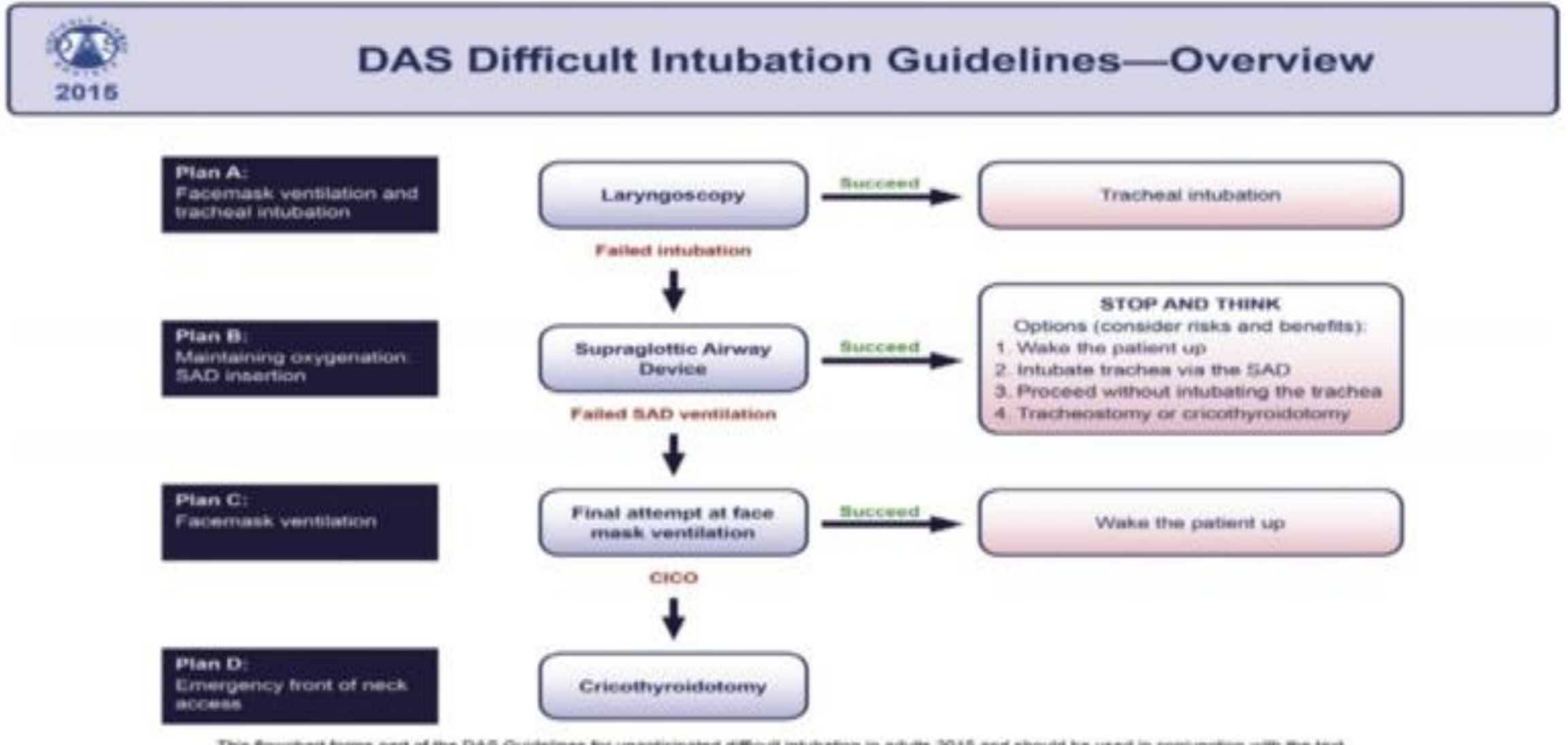
Invasive airway access<sup>(b)\*</sup>

Consider feasibility of other options<sup>(a)</sup>

Awaken patient<sup>(d)</sup>

Emergency invasive airway access<sup>(b)\*</sup>

# Difficult Airway Society(DAS) Guidelines of Difficult Intubation



# ID ( Optical Aids for known or predicted Difficult Airway and no need for Axis Alignment readily used with Topical Anesthesia)

1-Flexible Intubation Scopes( FISs)

2-Rigid Indirect Laryngoscopes

3-Intubating (lighted) Optical Stylets

4-Video Laryngoscopes (VLs)

- ▶ Indication : Impossible or Contraindication of Positioning , Anatomic Variation ( Redundant Soft Tissue , Protruding incisors , anterior Lumaarynx)
- ▶ Is well Tolerated in Awake Patients ( Less Tachycardia and Hypertension )
- ▶ Has Less Potential for Airway and Dental Trauma
- ▶ Can be performed in Multiple Position

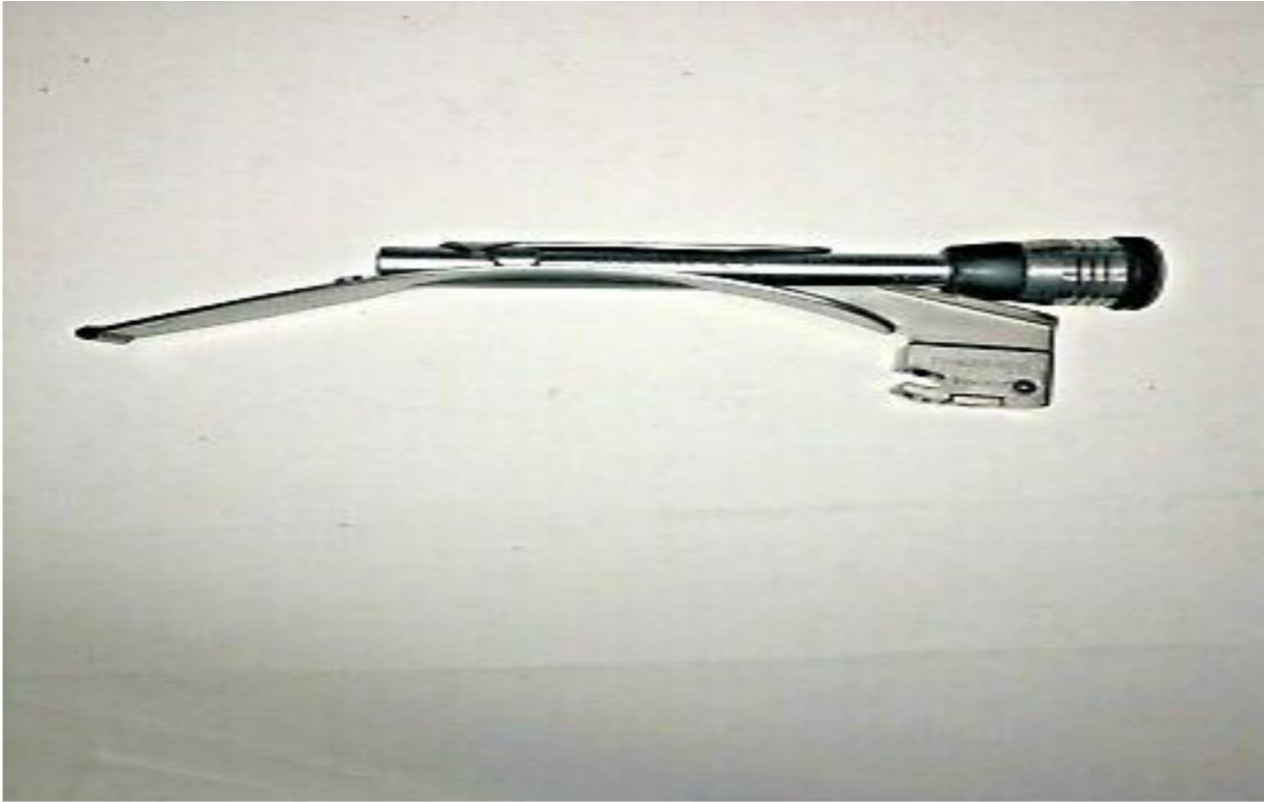
# Rigid indirect Laryngoscopes (Based on DL)

## Designed to project a Refracted image of Glottis

- ▶ Viewmax ID
- ▶ Truview ID
- ▶ Airtraq SP ID
- ▶ Airtraq Avant ID



# View Max



Rusch View Max, MAC 3 Size, Fiber Optic Laryngoscope w/View Finder Magnifier | eBay

\$117.00\* · Brand: Rusch



# Trueview PCD Video Laryngoscope



# Airtraq



[www.airtraq.com](http://www.airtraq.com)

[www.airtraq.com/wp-content/uploads/2020/08/a390-po...](http://www.airtraq.com/wp-content/uploads/2020/08/a390-po...)

# Airtraq Avant ( newer model , Has a Reusable Optic Piece , Disposable Blades)

10:13 [status icons]



 Airtraq

**AIRTRAQ AVANT: For routine intubations - Airtraq**

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# Pentax Airway Scope, Airtraq Laryngoscope



**FIGURE 27-17.** (A) The Pentax Airway Scope, (B) The Airtraq laryngoscope (Prodol Meditec S.A., Vizcaya, Spain).

# Lighted Optical Stylets

- ▶ Rigid or Semi Rigid Fiberoptic Devices such as Intubation Fiberscope( Karl Storz Endoscopy) a Malleable Shaft
  - 1- Bonfils Retromolar
  - 2-Shikani Optical Stylet with
  - 3- Levitan FPS Stylet (shorter version of the Shikani Stylet
  - 4- Clarus Video System( Newer Version of the Shikani Stylet( LCD Screen)
  - 5-Sensascope (Hybrid Rigid Optical Stylet With Video Chip Technology)
- ▶ Can be used on their Own or in Combination of DL or VAL
- ▶ Incorporate Optical and light Transmitting Component into a Tubular Stainless Steel Sheath over Which the ETT is Loaded
- ▶ Usefulness : Limited Neck Mobility , Small Mouth Opening , Abnormal Airway Anatomy , Anticipated Difficult Laryngoscopy

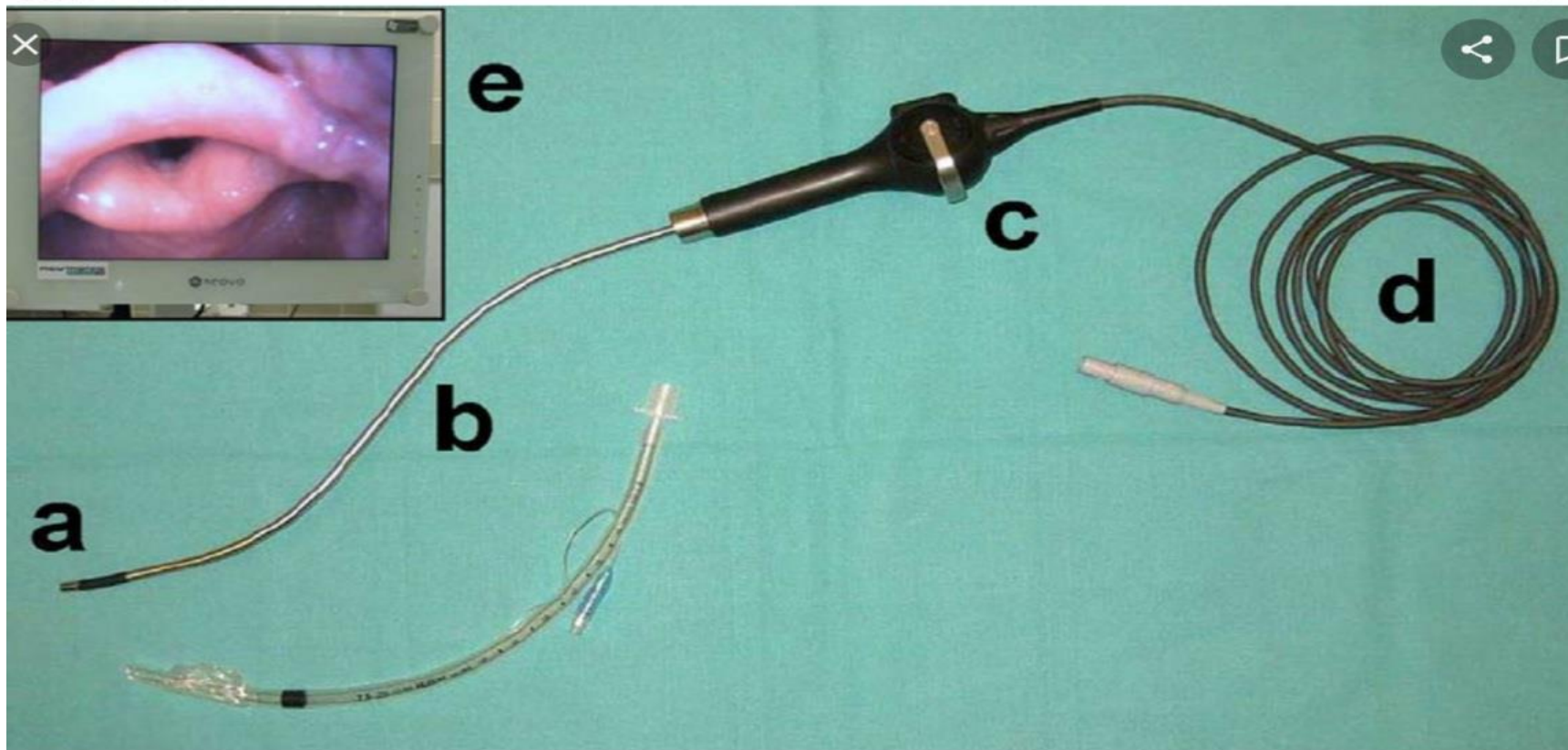
# Karl Storz Endoscopy



**FIGURE 27-11.** The Bonfilis (Karl Storz Endoscopy, Culver City, CA).  
Inset: Objective end within tracheal tube.



# SensaScope



 ResearchGate

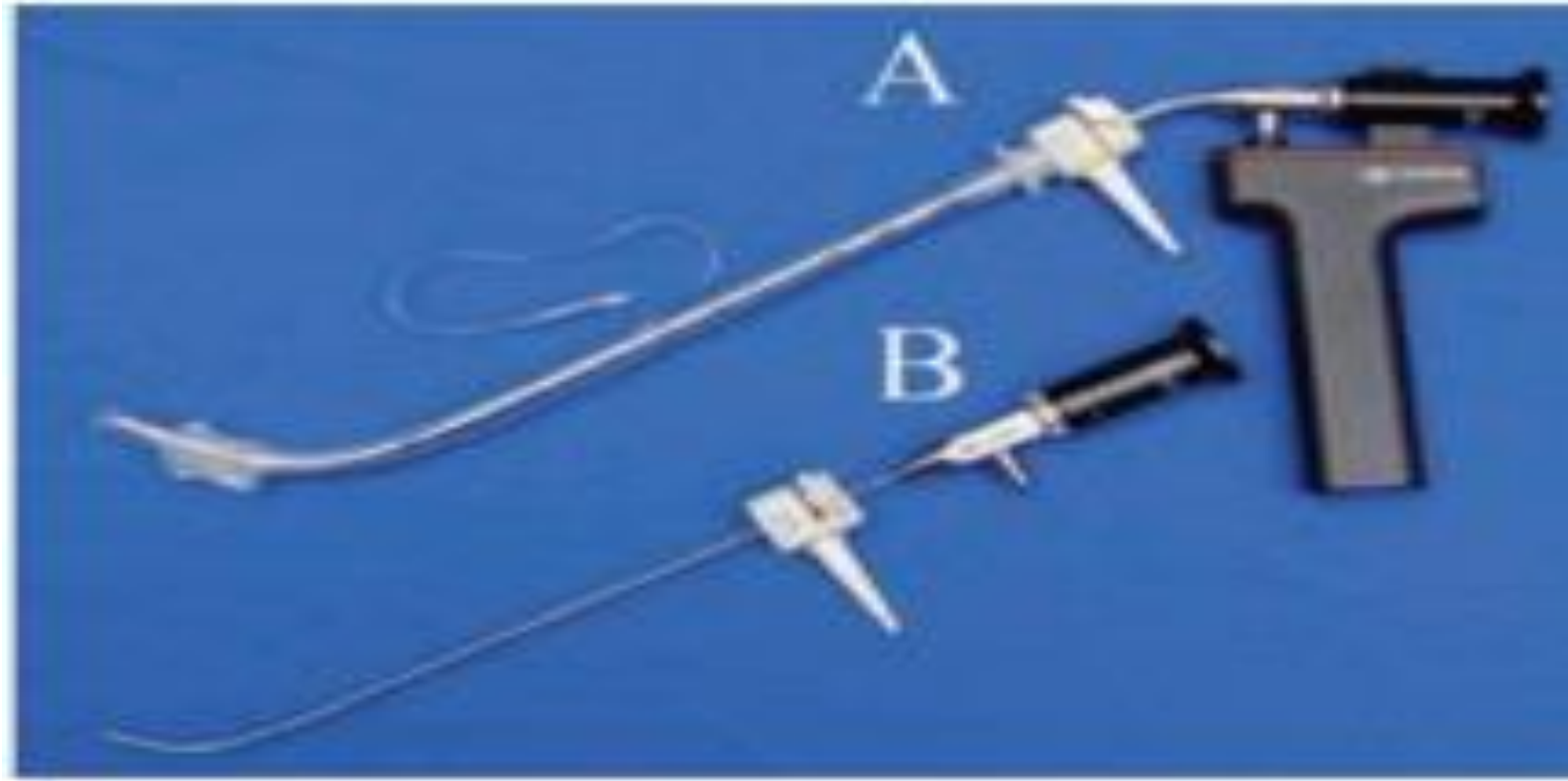
The SensaScope® is composed by a) a steerable tip, b) a rigid ...

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# Seeing Optical Stylet System (SOS)



High Resolution Fiberoptic Endoscope ,ETT is Mounted on the SOS , Maneuvers that Increase The Pharyngeal Space (Chin lift, Jaw Thrust, Tongue traction) Improve the Field of view

# Clarus



The advertisement features a large image of the Clarus Video System, which consists of a black endotracheal tube with a camera at the tip. The camera's LCD screen is extended and shows a clear view of the trachea. To the right of the main image, there is a diagram showing three different curved shapes of the flexible stylet, illustrating its adaptability for difficult airways. The background is white with green geometric shapes on the right side.

## CLARUS<sup>®</sup>

### VIDEO SYSTEM

Malleable stylet can be shaped to fit your patient's difficult airway

The Clarus Video System puts a high definition camera at the end of the ET tube, moving you closer to the gold standard and giving you superior vision for a conclusive intubation.

- Innovative digital stylet gives visual confirmation of ET tube placement, taking you all the way into the trachea
- 4-inch LCD screen and video-out capability

# Clarus Shikanin and Levitan Optical STYLET





# Levitan FPS( first pass success) Scope



# Lighted Stylet



Lighted Stylet for tracheal intubation SW-A02 – szsjwc

[Visit](#)

# Lighted Stylet



**Fig. 44.28** When the tip of a lighted stylet is placed at the glottic opening, a well-circumscribed glow can be seen in the anterior neck just below the thyroid prominence.



# References

- ▶ Basic of Anesthesia ,Ronald D Miller Manuel C. Pardo ,Jr 7<sup>th</sup> Edition 2018
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- ▶ Clinical Anesthesia Paul G. Barash 8<sup>th</sup> Edition 2020
- ▶ Anesthesia Secrets Brian Keech 6<sup>th</sup> Edition 2020
- ▶ Commings Otolaryngology 7<sup>th</sup> Edition 2021