Recent Advances in Airway Management

HA Convention 2014

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Recent Advances in Airway Management

1. • LMA & Newer Supraglottic Airway Devices
2. • Intubation
   - Video Technology
   - New Tube Design
   - Confirmation
3. • USG
4. • New Concepts

Airway Management

FACE MASK

INTUBATION

Dr. Archie Brain

LMA prototypes

[T. C. R. V. van Zundert: Anaesthesia 2012, 67, 1375–1385]

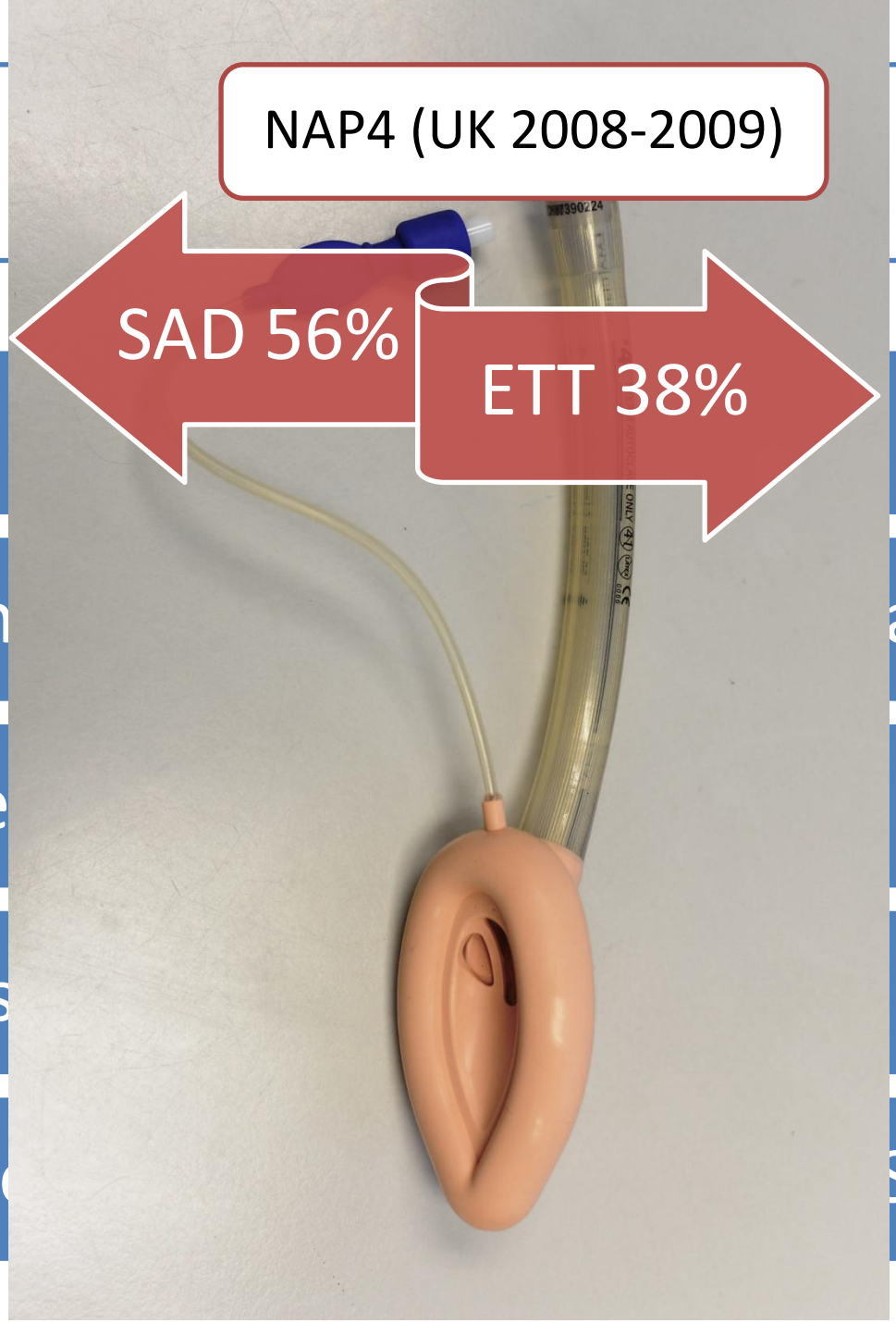
1987: LMA

Changed th afe airway

Perilaryngeal

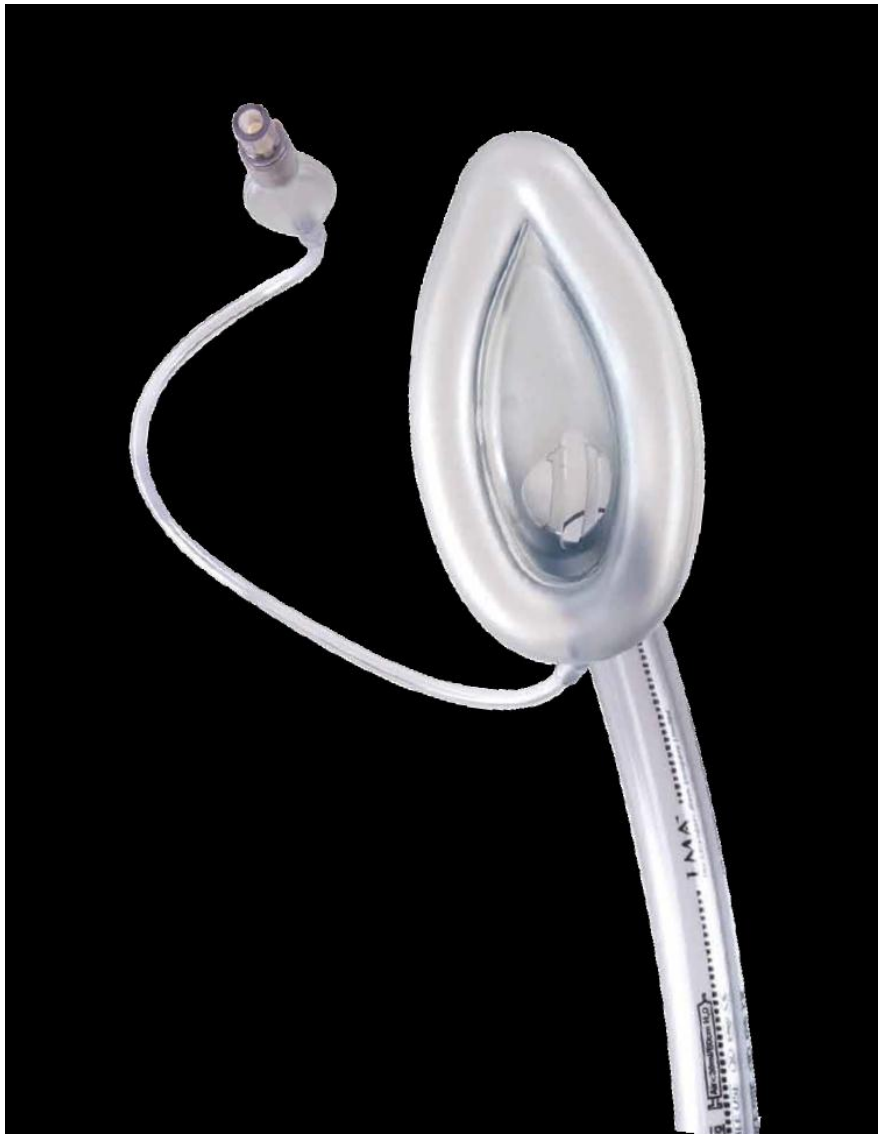
Invasiveness

Supraglottic SGAs]



1997: LMA Unique™

- Single use
- PVC
- Infection Control



Problems

- Regurgitation & Vomiting

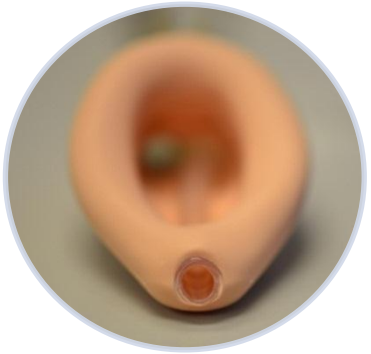
- Unstable position
- Folding
- Rotation

- Not designed for IPPV
- Leaking

Second Generation LMA

- Regurgitation & Vomiting

Drain Tube



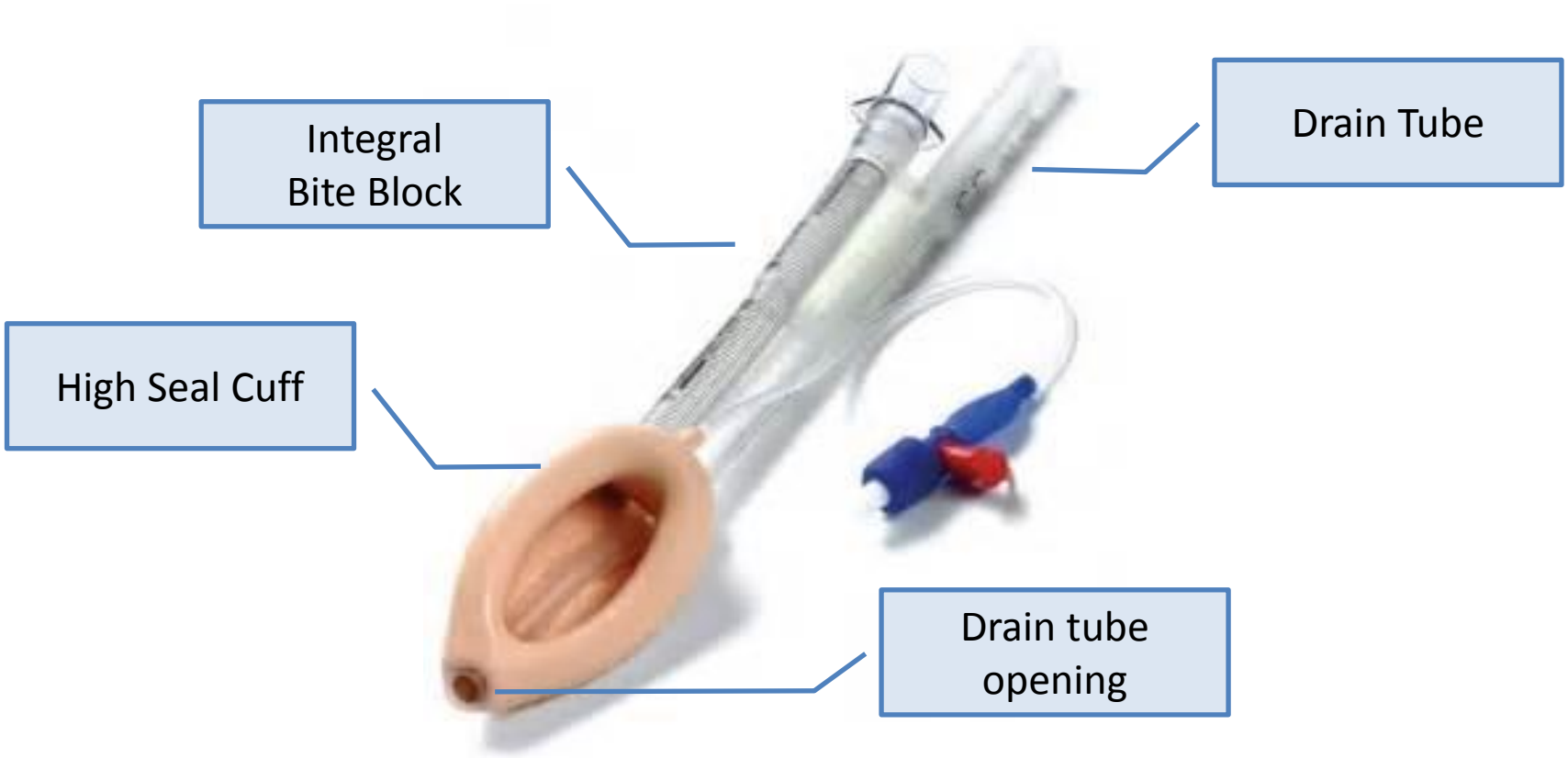
- Unstable position
- Folding
- Rotation

Wider Cuff & Oval Tube

- Not designed for IPPV
- Leaking

High Seal Cuff

2001: Proseal LMA



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BJA

Analysis of 1000 consecutive uses of the ProSeal laryngeal mask airway™ by one anaesthetist at a district general hospital†

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Background. The ProSeal laryngeal mask airway (PLMA), introduced to UK practice in late 2001, offers potential performance and safety benefits over other airways such as the classic laryngeal mask airway. There are no large series reporting its use.

Methods. Data from a prospective, consecutive series of 1000 size 3–5 PLMA uses, by one anaesthetist, were analysed to examine whether performance in routine and advanced practice is similar to that reported in formal trials.

Results. Patients were female in 52% of cases, median age 52 (range 8–101) yr, median weight 78 kg (10% over 100 kg, 24% over 90 kg). Procedures included 12% laparoscopic and 5% open abdominal surgery. Overall insertion success was 99.4%, (first and second attempt success 85% and 12%, respectively). Median insertion time was 12 s (93% <30 s). Insertion success did not differ between genders, or between mask sizes. Median airway seal was 32 cm H_2O (range 8–40, 94% seal >20 cm H_2O). Specific tests confirmed correct positioning in 98.5% of cases. Of six failures, two occurred during management of difficult airways. Minor airway obstruction occurred in 2.7%. Blood was visible on 8% of removed PLMAs and more commonly after more than one insertion attempt (38 *vs* 4.7%, χ^2 $P<0.0001$). In three cases

Supreme LMA

- disposable, curvature tube, easier to insert

~ Fastrach
  - fixed curve tube and guiding handle
  - easy Insertion and fixation

~ ProSeal
  - high seal cuff: to facilitate ventilation
  - gastric access: airway protection
  - bite block: air way obstruction

~ Unique
  - disposable

- [Anaesthesia, 2008, 63, pages 202–213]

Cuff Sealing

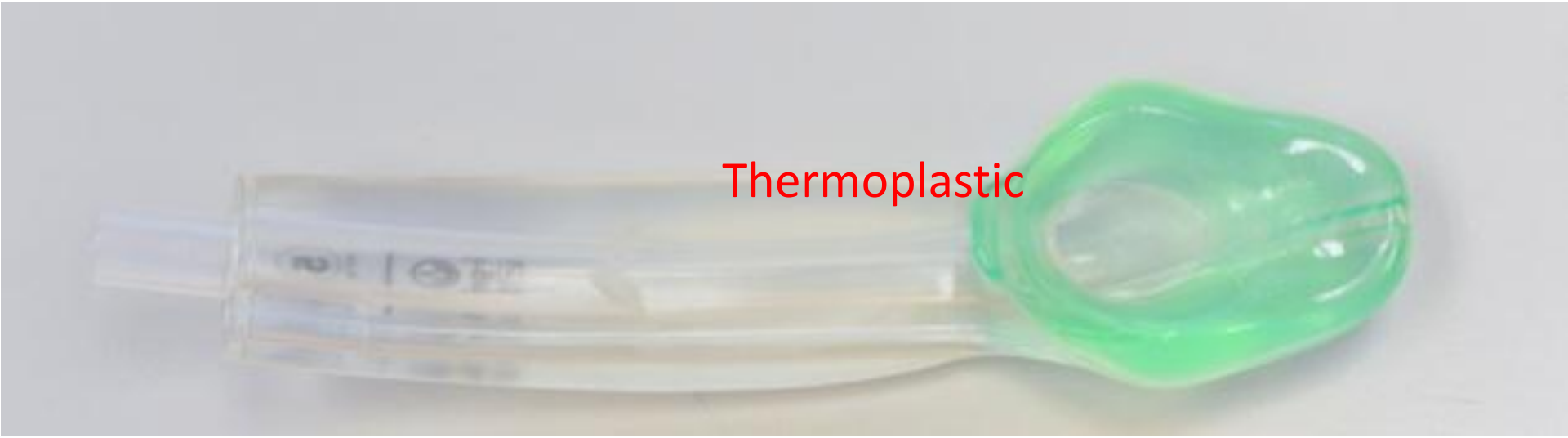
- Oropharyngeal Leak Pressure (OLP)
  - efficacy & safety

Vs.

- Intracuff Pressure
  - postop. Pharyngolaryngeal adverse events

Emerging New Concepts (1)

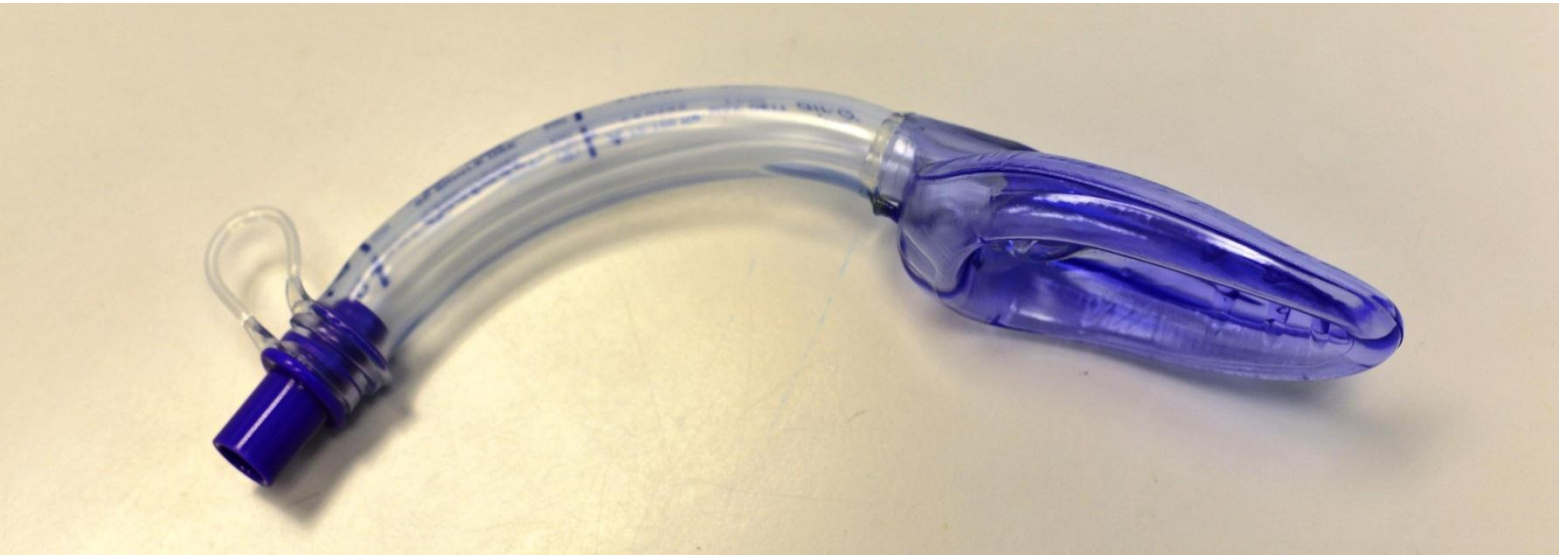
- LMA Cuff Pressure or No inflation
- 80 – 60 – 40 cmH_2O
- No inflation (e.g. I-gel)



Insertion of I-Gel

Emerging New Concepts (1)

- LMA Cuff Pressure or No inflation
- 80 – 60 – 40 cmH_2O
- No inflation (e.g. I-gel)
- Self Pressurizing (e.g. *air-Qsp*)



Intubating SADs

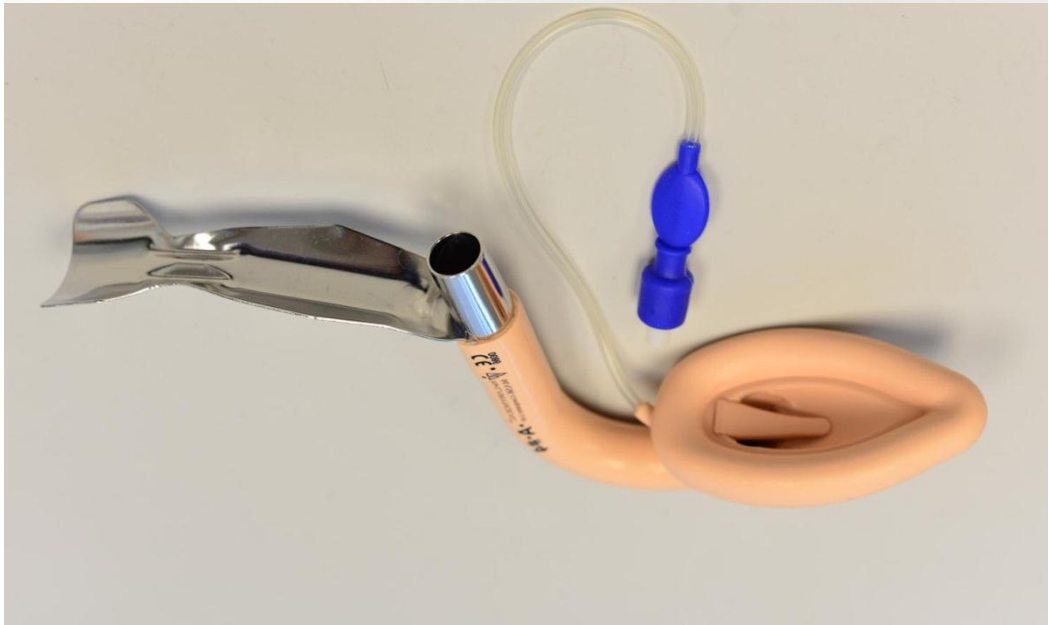
- *Air-Qsp* (single use)

- LMA Fastrach

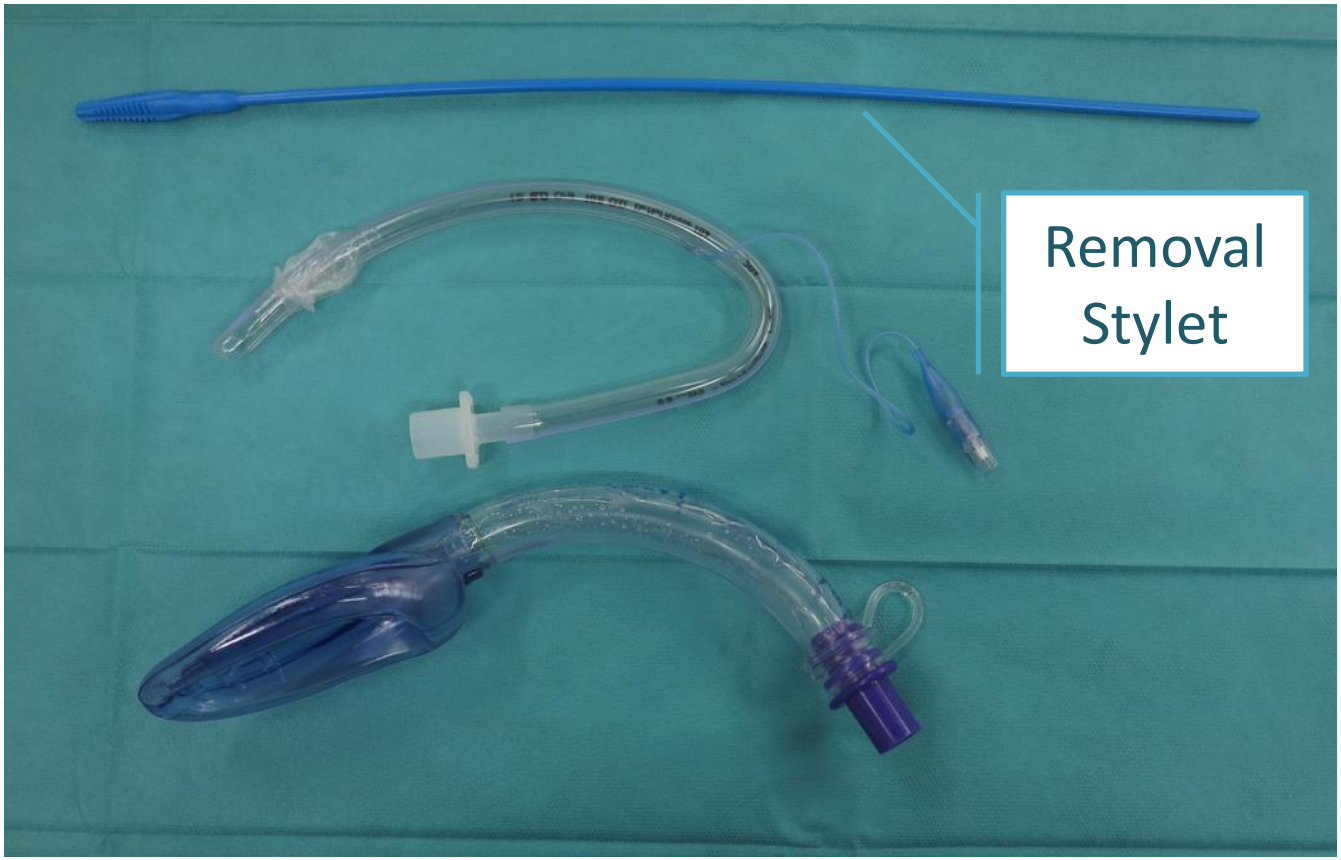
Intubating SADs

- *airQsp* (single use)

- LMA Fastrach



Air-Qsp intubation set



Intubation with *air-Qsp*

The role of SADs in airway management:

1. Alternative to the face mask (FM) and the endotracheal tube (ETT) in elective surgery
2. Use as a primary airway rescue device in the pre-hospital environment
3. Rescue of the airway after failure of either mask ventilation, tracheal intubation or both

American Society of Anesthesiologists

DIFFICULT AIRWAY ALGORITHM

***Confirm ventilation, tracheal intubation, or SGA placement with exhaled CO_2.**

a. Other options include (but are not limited to): surgery utilizing face mask or supraglottic airway (SGA) anesthesia (e.g., LMA, ILMA, laryngeal tube), local anesthesia infiltration or regional nerve blockade. Pursuit of these options usually implies that mask ventilation will not be problematic. Therefore, these options may be of limited value if this step in the algorithm has been reached via the Emergency Pathway.

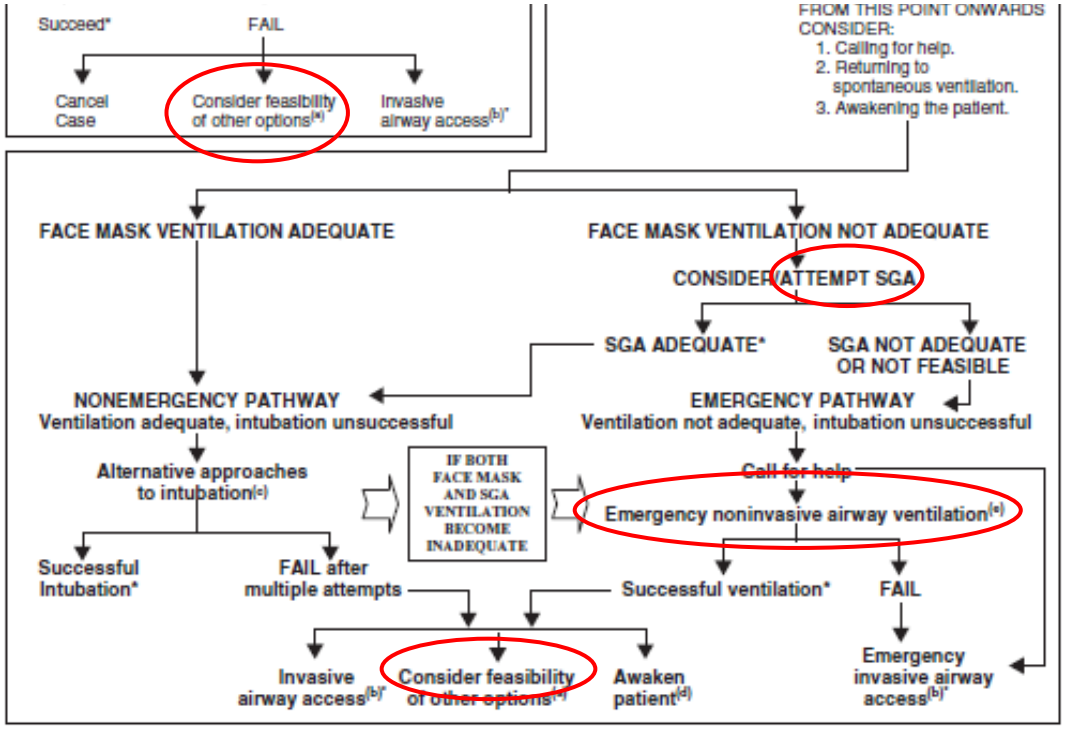
b. Invasive airway access includes surgical or percutaneous airway, jet ventilation, and retrograde intubation.

c. Alternative difficult intubation approaches include (but are not limited to): video-assisted laryngoscopy, alternative laryngoscope blades, SGA (e.g., LMA or ILMA) as an intubation conduit (with or without fiberoptic guidance), fiberoptic intubation, intubating stylet or tube changer, light wand, and blind oral or nasal intubation.

d. Consider re-preparation of the patient for awake intubation or canceling surgery.

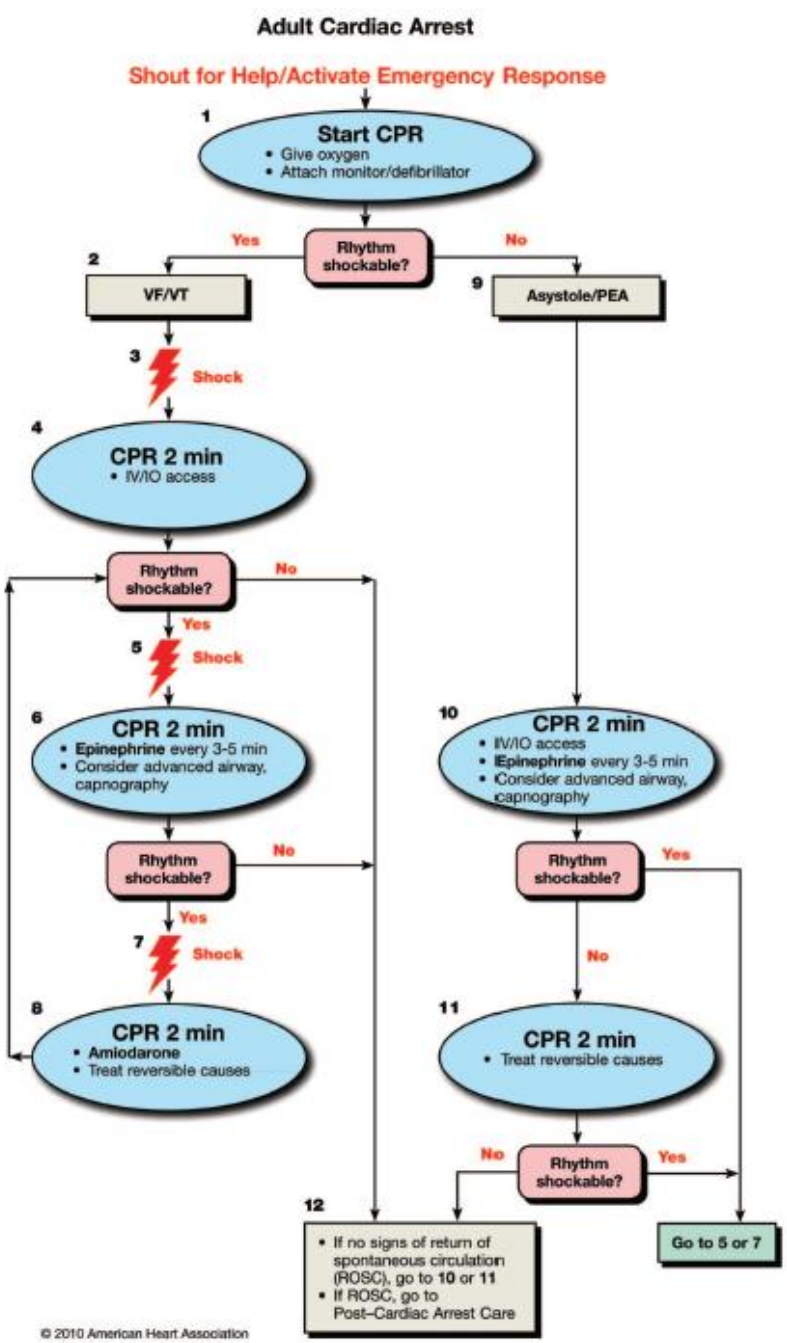
e. Emergency non-invasive airway ventilation consists of a SGA.

Fig. 1. Difficult Airway Algorithm.



*Confirm ventilation, tracheal intubation, or SGA placement with exhaled CO_2.

2010 AHA Guidelines for CPR and Emergency Cardiovascular Care Science:



CPR Quality
- Push hard (≥2 inches [5 cm]) and fast (≥100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 30:2 compression-ventilation ratio
- Quantitative waveform capnography
  - If P_{ETCO_2} <10 mm Hg, attempt to improve CPR quality
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Shock Energy
- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy
- **Epinephrine IV/IO Dose:** 1 mg every 3-5 minutes
- **Vasopressin IV/IO Dose:** 40 units can replace first or second dose of epinephrine
- **Amiodarone IV/IO Dose:** First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway
- Supraglottic advanced airway or endotracheal intubation
- Waveform capnography to confirm and monitor ET tube placement
- 8-10 breaths per minute with continuous chest compressions

Reversible Causes
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

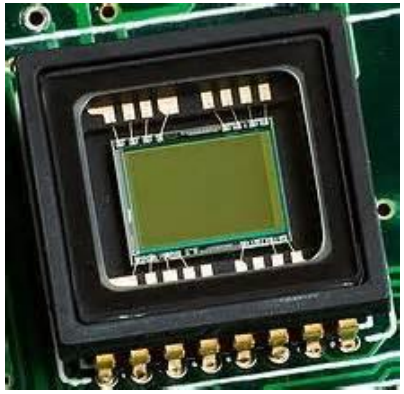
SAD or ETT

Figure 1. ACLS Cardiac Arrest Algorithm.

Intubation

- Digital era
- CCD/CMOS Camera & HDTV System
- Clarity of image (HD), wider viewing angle
- One operator can see
  → all personnel (assistant, trainee/supervisor)

- Video-laryngoscope
- Video-bronchoscope



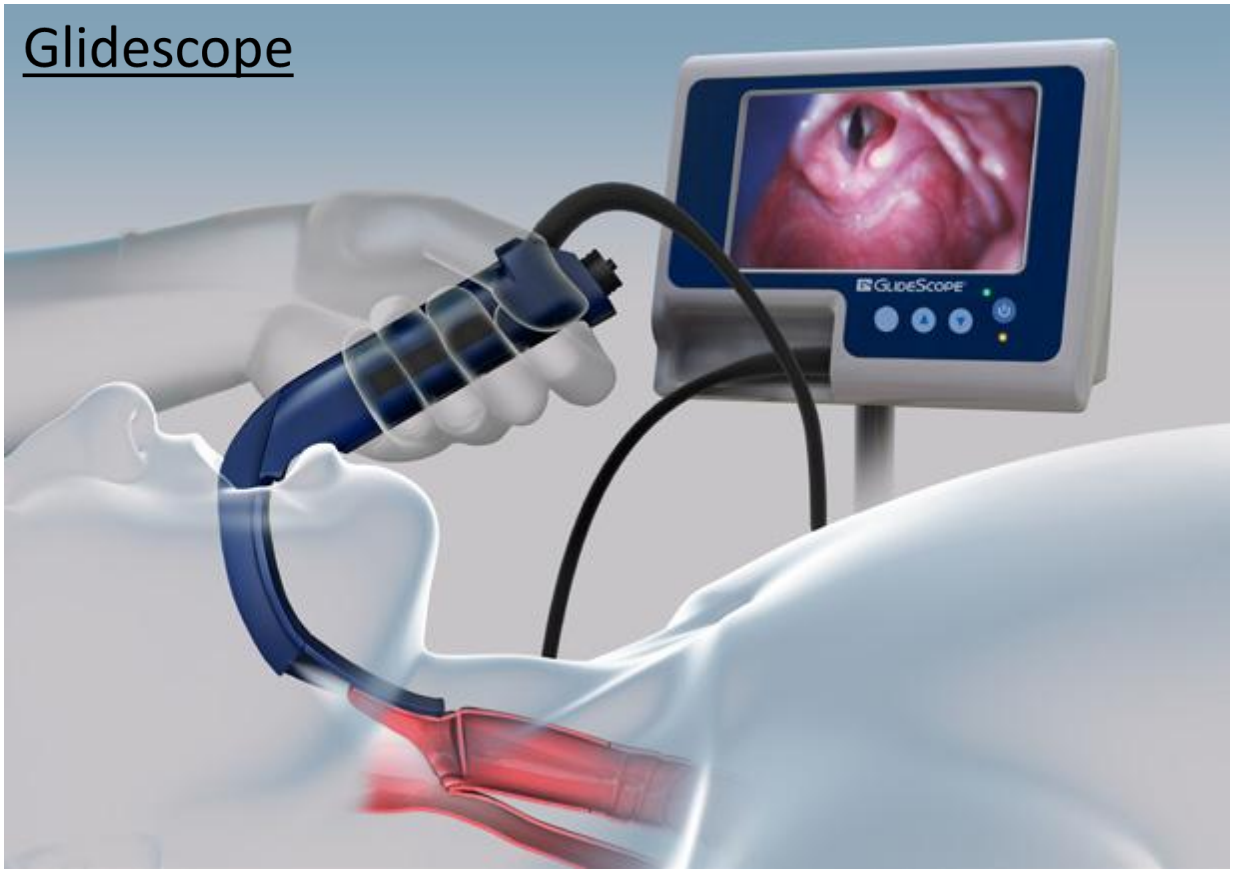
CCD

Video Laryngoscope

C-MAC

Glidescope

McGrath



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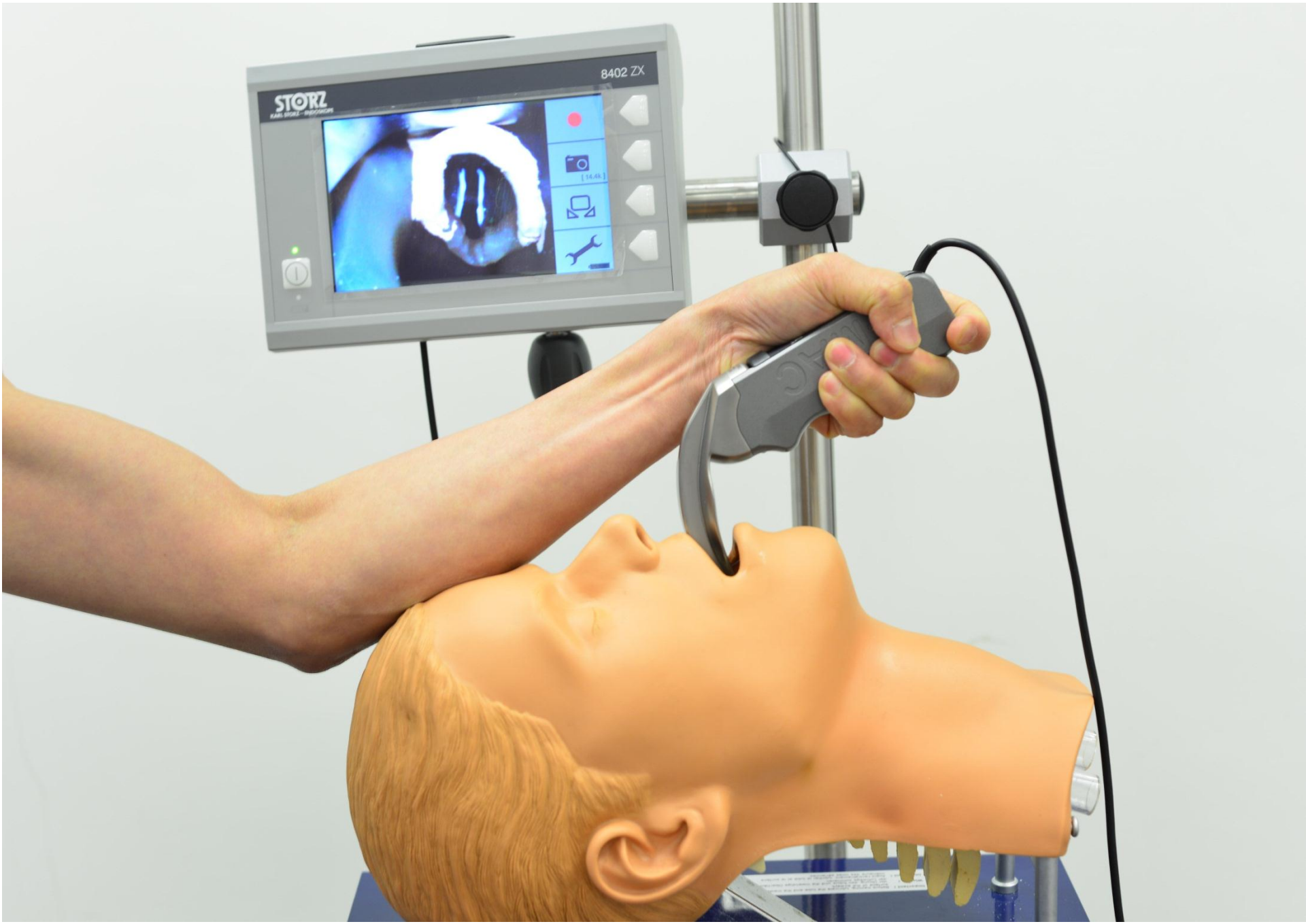

STORZ
8402 ZX

Intubation: Video laryngoscope

- Patient Neutral Head & Neck
- Significantly less force - teeth and the soft tissues of mouth and pharynx
- the image is usually obtained at the tip of the laryngoscope blade, whether with CMOS sensors or through FOB
- not possible to obtain a direct view of the glottis with the sharply curved or angled “look around the corner” videoscope blade.
- a fully functional electronic system.


Fibrescope

Intubation: Video Bronchoscope

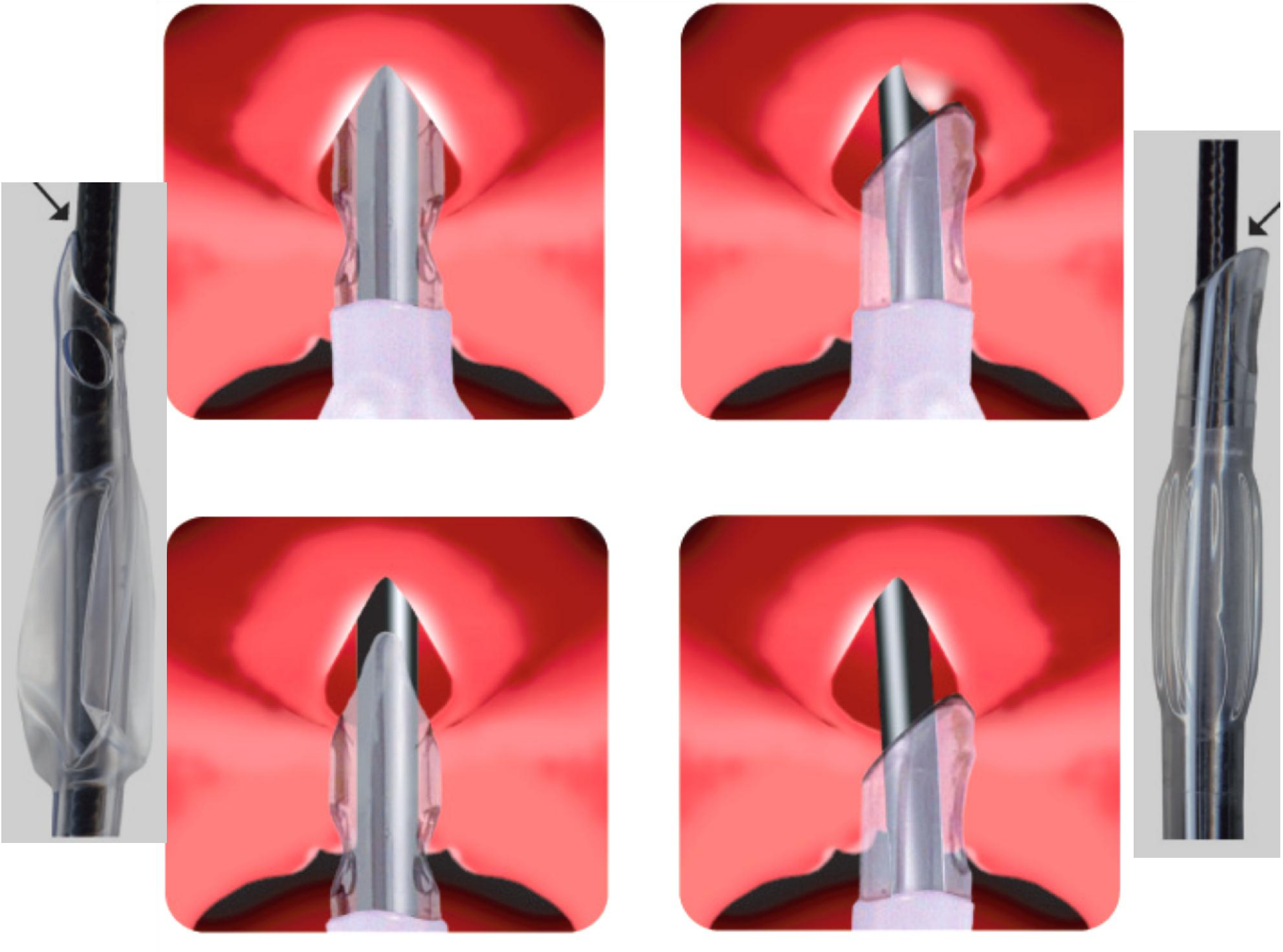
- From Fiberscope to Video bronchoscope
- Manual adjustment → Autofocus / electronic zooming & image processing
- Fragile Optic Fiber → No more
- One operator can see → all personnel
- fragile optic fibres (fiberoptics and a monocular eyepiece)


C-MAC®
System

The Parker Tube™

- soft, flexible, curved, centered, distal
- tip lies against the wall of the FOB or introducer
- Reduce hang-ups in the larynx

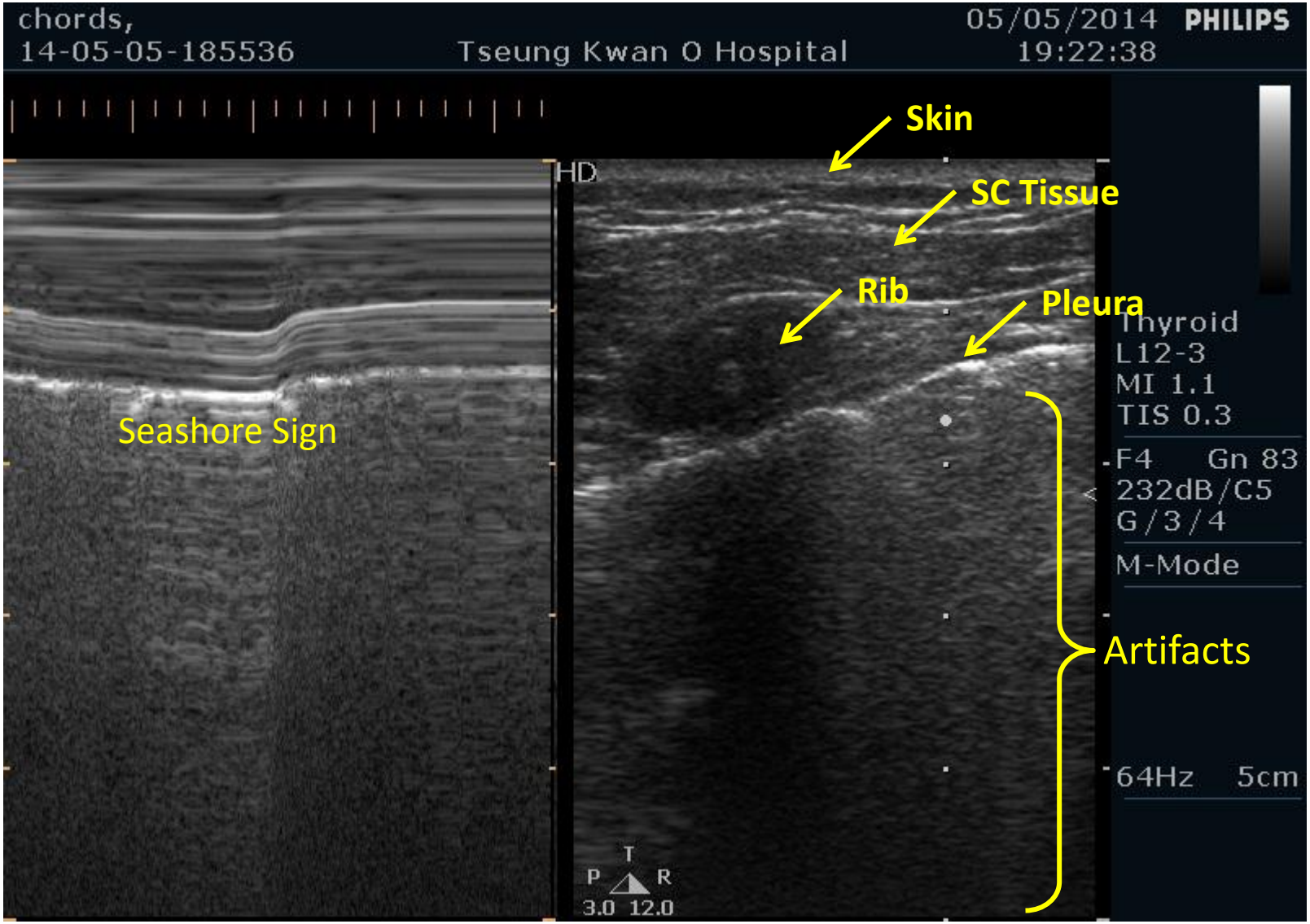
flexible, curved, centered, tapered distal tip traumatic intubation



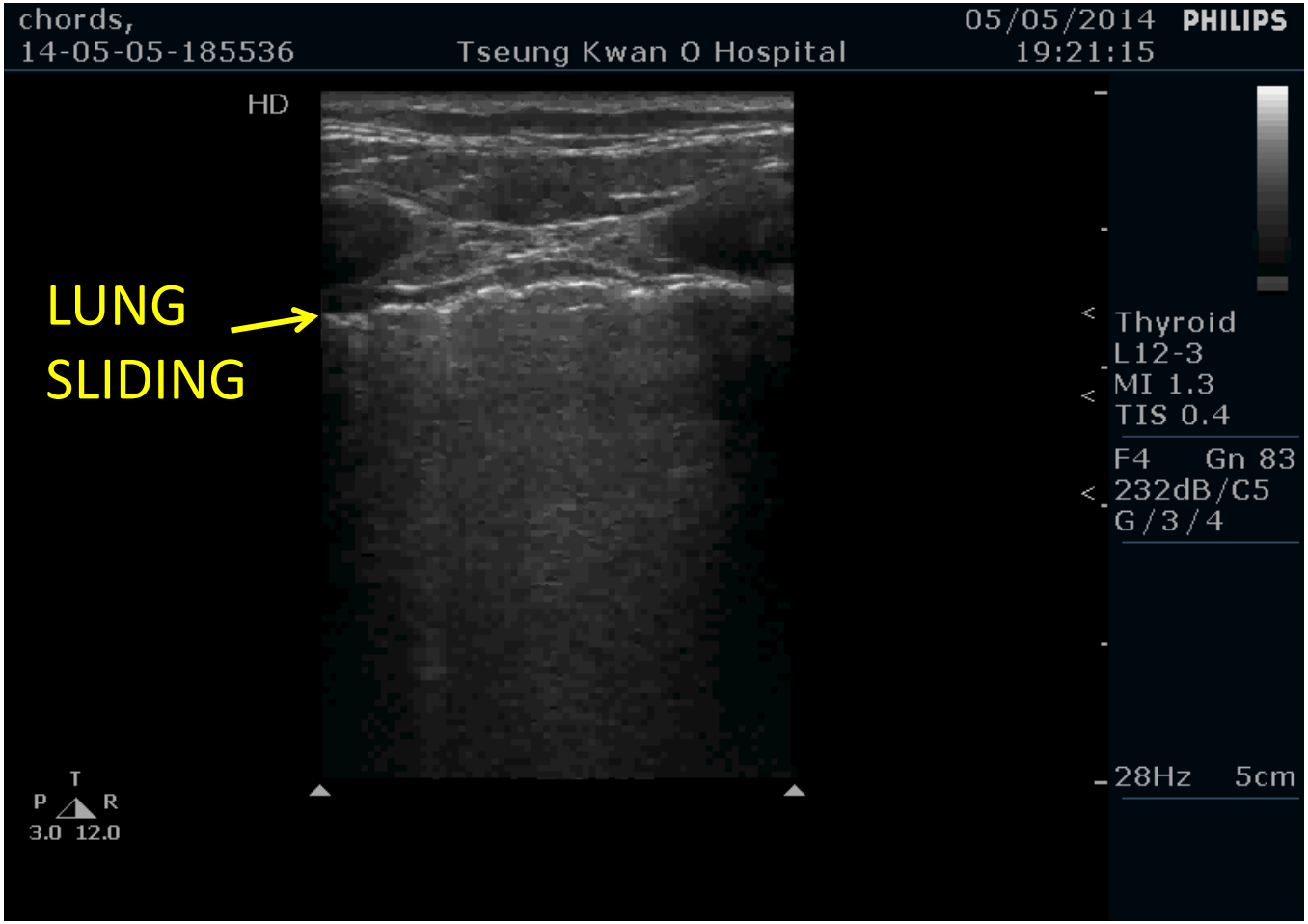
Confirmation of ETT (1)

- $ETCO_2$ (CPR – AHA 2010 Guideline)
- But Cardiac Arrest may be Low/No CO2
- Can’t distinguish one-lung intubation

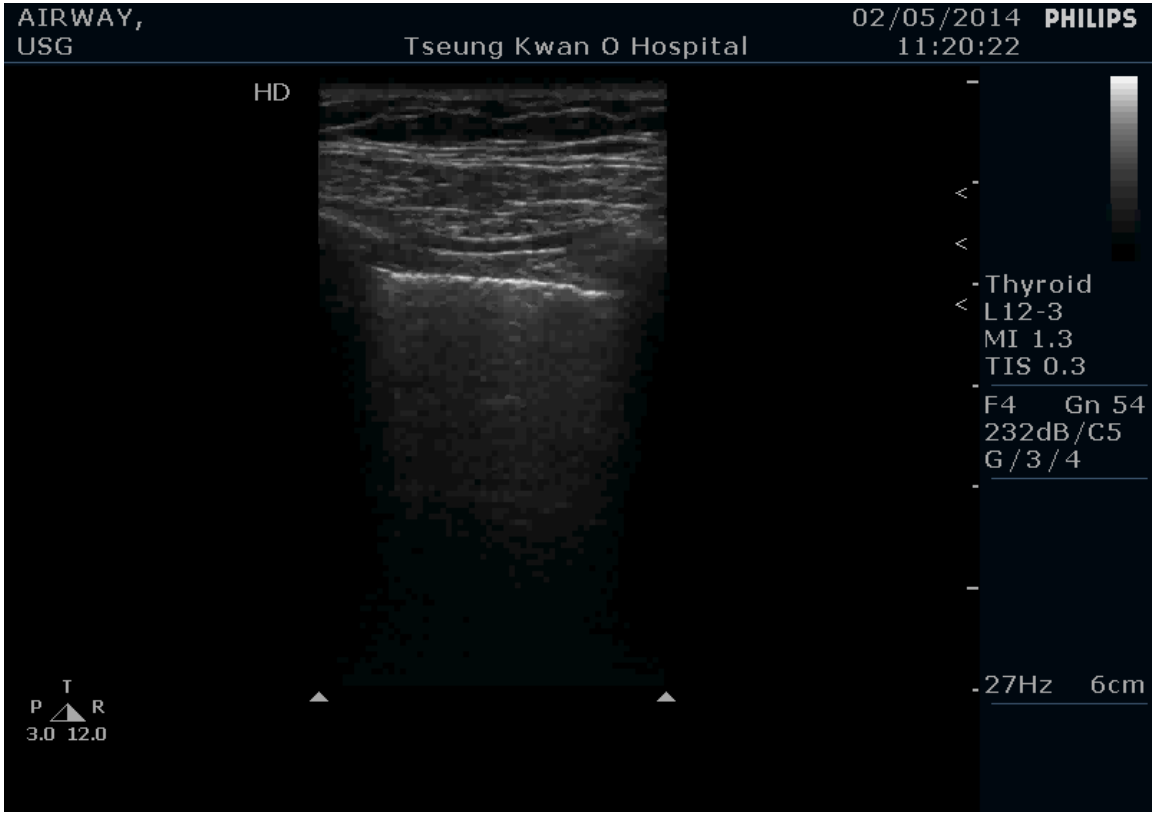
Confirmation of ETT (2) – Lung USG

- 

Confirmation of ETT (3)



Lung slide & pulse



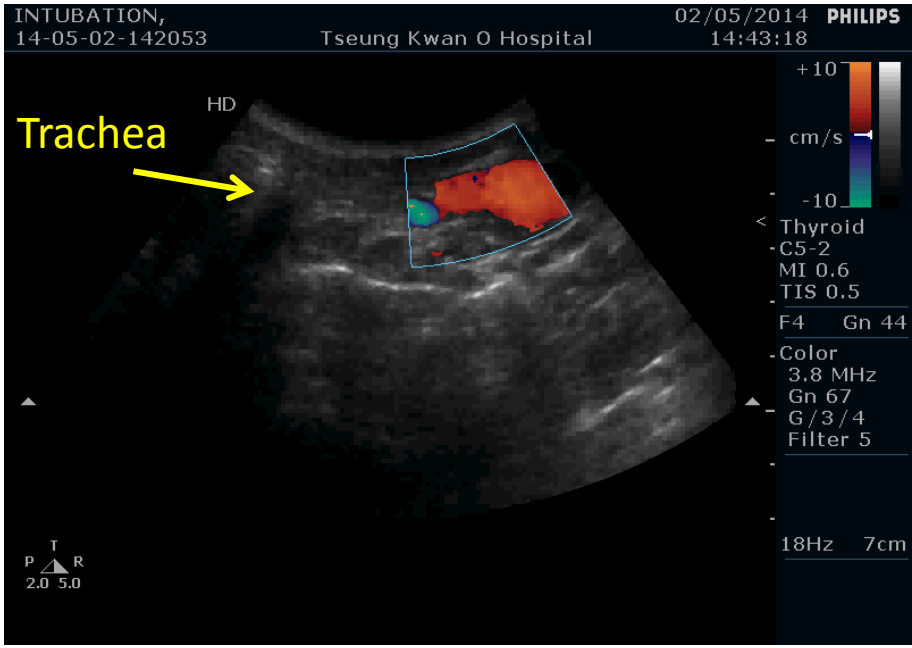
Confirmation of ETT (4)

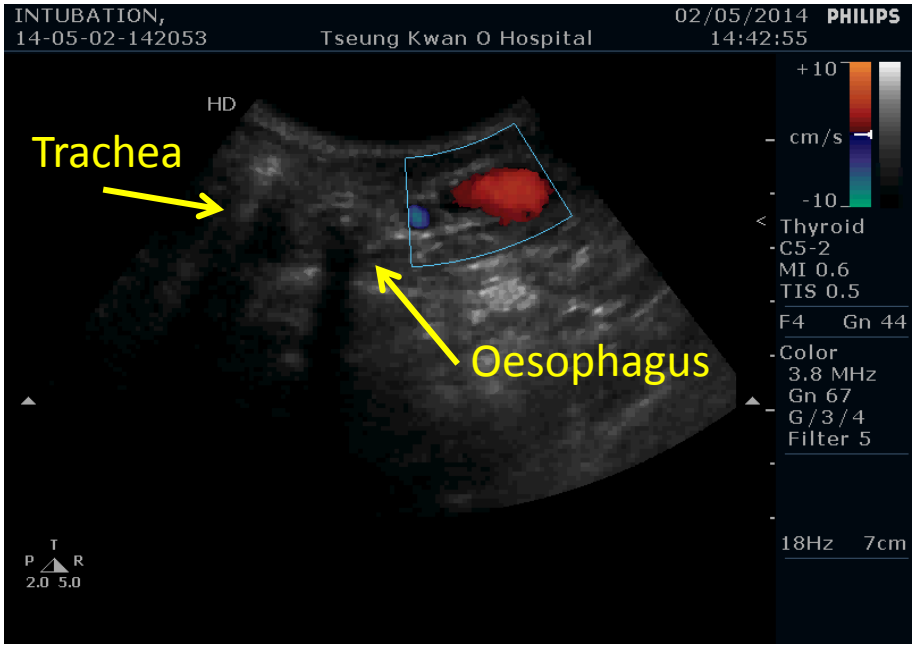
- Endotracheal placement
  - Lung Sliding Sign +ve (both sides)

- Endobronchial intubation
  - Lung Sliding Sign –ve (non-ventilating side)
  - Lung Pulse +ve

Airway Ultrasonography (1)

- Detect
  - Oesophageal Intubation

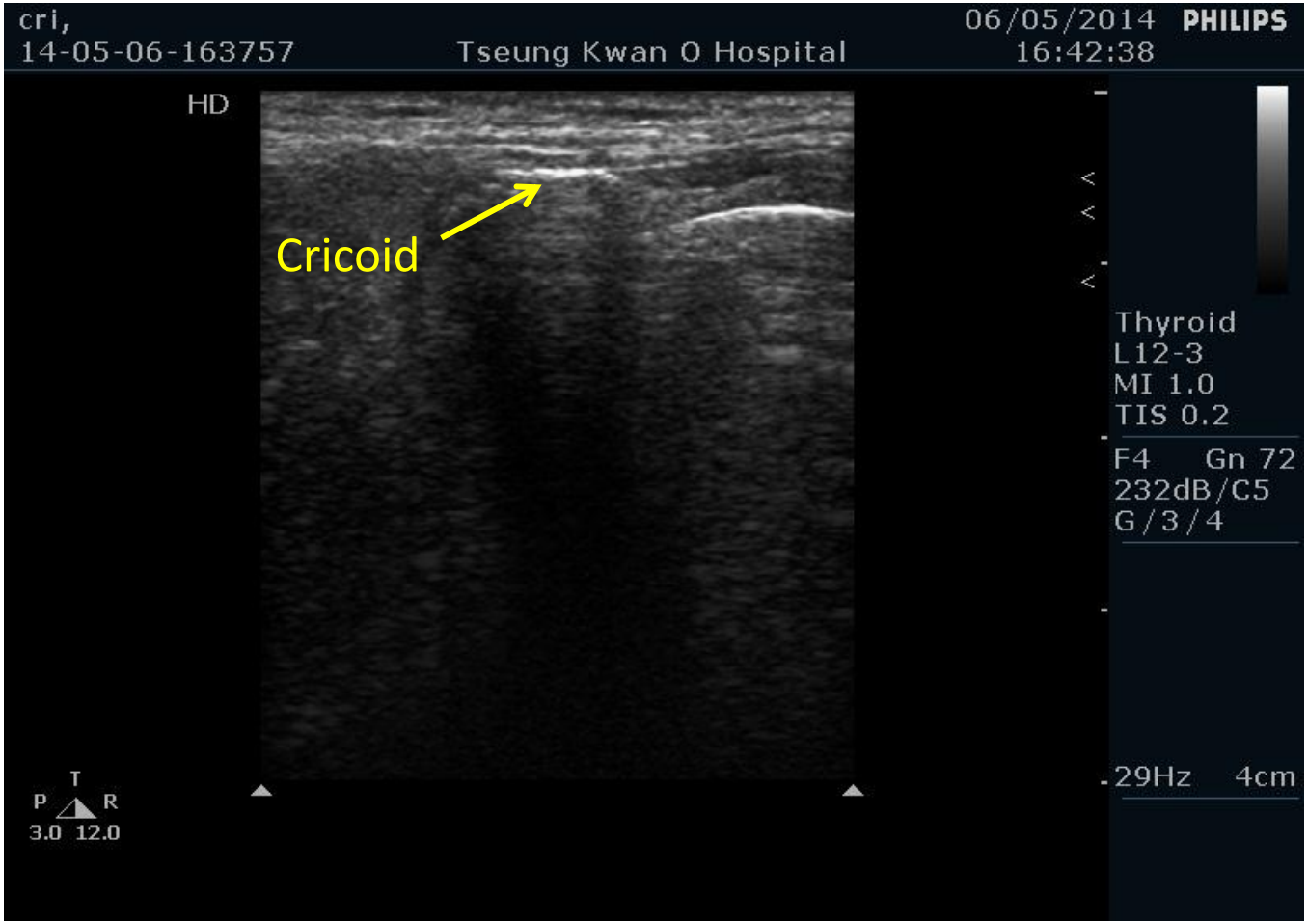


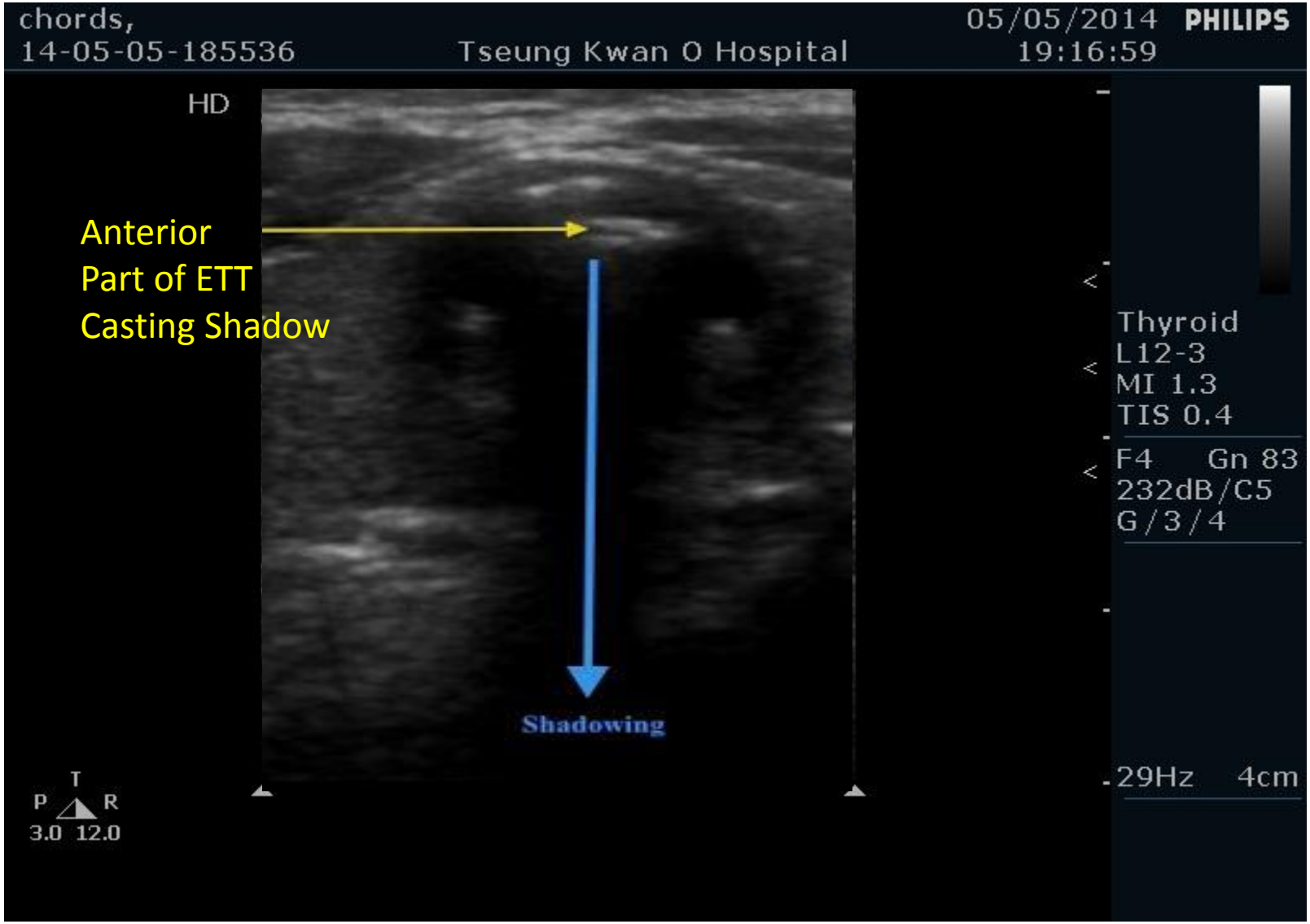


Airway Ultrasonography (2)

- Identify
  - trachea,
  - cricothyroid membrane
  - (Prediction of difficult airway management)

Parasagittal view at mid-neck

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Tseung Kwan O Hospital
05/05/2014
19:16:59
PHILIPS
HD
Anterior
Part of ETT
Casting Shadow
Shadowing
Thyroid
L12-3
MI 1.3
TIS 0.4
F4 Gn 83
232dB/C5
G/3/4
29Hz 4cm
T
P R
3.0 12.0

Emerging New Concepts (2) – Evolution of anatomical concepts pertaining to the paed. larynx

1. 1951 Eckenhoff, based on cadaveric findings

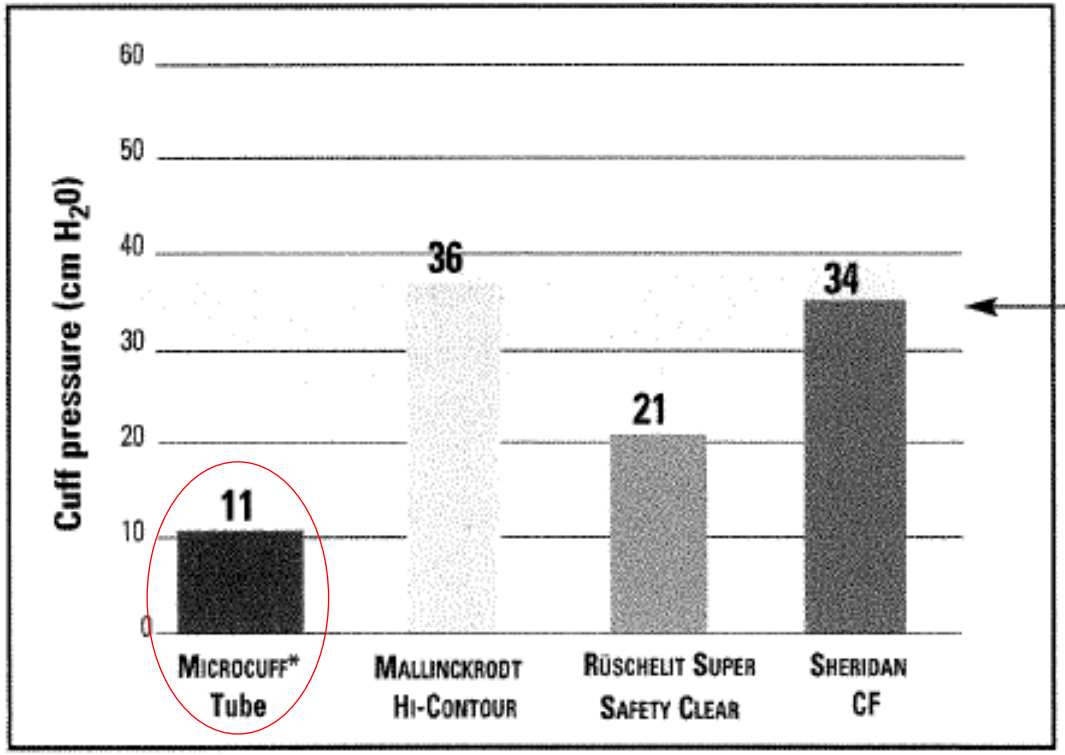
- cricoid is rigid, cannot be distended
- 2003 MRI study : narrowest part is at the level of vocal cords,
  larynx is more cylindrical than previously thought;
- cricoid is the site of highest risk of injury; cricoid is elliptical, not circular, with larger AP diameter, ETT cuff may cause lateral wall compression & ischaemia

2. has the time come to use cuffed tubes in kids?

- short term intubation
- control of head mobility when the ETT is in-situ
- frequent cuff pressure monitoring on the whole is safe
- additional advantage cuffed ETT (less chance of changing different sizes)
- Low pressure cuffed tube – Microcuff ETT

Microcuff tube

MICROCUFF* tube seals at a lower pressure than conventional pediatric tubes[4]



Capillary perfusion pressure in adults is 27-40 cm H_2O;[1,2] considered lower in pediatrics.

Median cuff pressure to seal the trachea in children aged 2-4 (n=4x20 patients, ID 4.0mm). Sealing pressure assessed by ascultation within 5 minutes after intubation.

Conflicts of interest

- The speaker declares no conflicts of interest

Thank You